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OF

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FOR

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THE ROYAL SOCIETY of New South Wales originated in 1821 as the "Philosophical Society of Australasia," after an interval of inactivity, it was resuscitated in 1850, under the name of the "Australian Philosophical Society," by which title it was known until 1856, when the name was changed to the "Philosophical Society of New South Wales"; in 1866, by the sanction of Her Most Gracious Majesty the Queen, it assumed its present title, and was incorporated by Act of the Parliament of New South Wales in 1881.

CLARKE MEMORIAL LECTURES.

The three Lectures on the "Geology of Australia" which were to have been delivered to the Members of the Royal Society of New South Wales in November, 1889, have been further postponed owing to the absence of Mr. C. S. Wilkinson, F.G.S., Government Geologist, in England on Departmental business.

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The Honorary Secretaries request that authors of papers (to be read before the Royal Society of New South Wales) requiring illustrations by photo-lithography, will before preparing such drawings make application to the Assistant Secretary for patterns of the standard sizes of diagrams &c. to suit the Society's Journal.

CONTENTS.

VOLUME XXIII.

	Page.
Officers for 1889-90	vii.
Art. I.—President's Address. By Sir Alfred Roberts... ...	1
Art. II.—Note on the Composition of two Sugar Plantation Soils. By W. A. Dixon, F.I.C., F.C.S., Lecturer on Chemistry, Sydney Technical College	32
Art. III.—The Aborigines of Australia. By W. T. Wyndham, Boyne Island, Queensland	36
Art. IV.—Note on the Recent Rain Storm. By H. C. Russell, B.A., F.R.S....	42
Art. V.—On the High Tides of June 15—17th. By John Tebbutt, F.R.A.S., &c.	51
Art. VI.—The Source of the Underground Water in the Western Districts. By H. C. Russell, B.A., F.R.S.	57
Art. VII.—On the application of Prismatic Lenses for making Normal-sight Magnifying Spectacles. By Percy J. Edmunds (*with illustrations*)	64
Art. VIII.—Flying-machine Memoranda. By Lawrence Hargrave *Eight diagrams*)	70
Art. IX.—Irrigation in its relation to the Pastoral Industry of New South Wales. By H. G. M'Kinney, M.E., Roy. Univ. *Irel.*, M.I.C.E. (*With maps.*)	75
Art. X.—The Eruptive Rocks of New Zealand. By Prof. F. W. Hutton, Hon. Mem. Royal Society, N.S.W. (*One Plate*) ...	102
Art. XI.—List of the Marine and Fresh-water Invertebrate Fauna of Port Jackson and the Neighbourhood. By Thomas Whitelegge, F.R.M.S.	163
Art. XII.—The Analysis of the Prickly Pear. By W. M. Hamlet, F.C.S., F.I.C., Government Analyst	324
Art. XIII.—On the occurrence of Arabin in the Prickly Pear, *(Opuntia Braziliensis)*. By W. M. Hamlet, F.C.S., F.I.C., Government Analyst	325
Art. XIV.—Notes on some New South Wales Minerals. By C. H. Mingaye, F.C.S.	326
Art. XV.—Notes on Goulburn Lime. By E. C. Manfred ...	328
Art. XVI.—The Australian Aborigines. By Rev. John Mathew, M.A., Coburg, Victoria (*With Plate and Map*)	335

ART. XVII.—Aids to Sanitation in Unsewered Districts: (Poudrette Factories.) By J. Ashburton Thompson, M.D., D.P.H., Chief Medical Inspector, Health Department, Government of New South Wales 450

ART. XVIII.—Well and River Waters of New South Wales. By W. A. Dixon, F.I.C., F.C.S., Lecturer on Chemistry, Sydney Technical College. 465

ART. XIX.—The Aborigines of Australia, being personal recollections of those tribes which once inhabited the Adelaide Plains of South Australia. By Edward Stephens, Bangor, Tasmania 476

New South Wales as a Health Resort in Phthisis Pulmonalis. By Dr. Bernard James Newmarch. (Read before the Medical Section)... 503

LECTURE—The present state of applied Electrical Science. By Prof. Threlfall, M.A. 511

„ The Evolution of the Kerosene Lamp. By W. M. Hamlet, F.C.S., F.I.C. 511

RECEPTION TO THE MEMBERS OF THE ROYAL SOCIETY OF N.S.W... 157

PROCEEDINGS 18, 45, 53, 97, 159, 330, 511

PROCEEDINGS OF THE MEDICAL SECTION 521

PROCEEDINGS OF THE MICROSCOPICAL SECTION 522

ADDITIONS TO THE LIBRARY 524

EXCHANGES AND PRESENTATIONS MADE BY THE ROYAL SOCIETY OF NEW SOUTH WALES, 1889.

INDEX.

RAINFALL MAP OF N.S.W. DURING 1889. BY H. C. RUSSELL, B.A., F.R.S.

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The Society's House, Sydney, 25th May, 1889.

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OF THE

ROYAL SOCIETY

OF

NEW SOUTH WALES,

EDITED BY

THE HONORARY SECRETARIES.

CONTENTS.

	PAGE
Anniversary Address. By Sir Alfred Roberts	1
Note on the Composition of two Sugar Plantation Soils. By W. A. Dixon, F.I.C., F.C.S., Lecturer on **Chemistry, Sydney Technical College**	32
Aborigines of Australia. By W. T. Wyndham, Boyne Island, Queensland ..	36
Note on the recent Rain Storm By H. C. Russell, B.A., F.R.S.	42
On the High Tides of June 15—17th. By John Tebbutt, F.R.A.S., &c. ..	51
Source of the Underground Water in the Western Districts. By H. C. Russell, B.A., F.R.S.	57
On the application of Prismatic Lenses for making normal sight magnifying Spectacles. (With illustrations). By Percy J. Edmunds.	64
Flying-machine Memoranda. By Lawrence Hargrave, (Eight diagrams.) ..	70
Irrigation in its relation to the Pastoral Industry of New South Wales. By H. G. M'Kinney, M.E., M.I.C.E. (Two maps.)	75
Eruptive Rocks of New Zealand. By Prof. F. W. Hutton, Hon. Mem. Royal Society, N.S.W. (One Plate.)	102
Proceedings, Donations, &c.	...18, 45, 53, 97, 157

THE AUTHORS OF PAPERS ARE ALONE RESPONSIBLE FOR THE OPINIONS EXPRESSED THEREIN.

Mo. Bot. Garden.

1897.

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ANNIVERSARY ADDRESS.

By Sir ALFRED ROBERTS, President.

[*Delivered to the Royal Society of N.S.W., May 1, 1889.*]

GENTLEMEN,—

IT would have been an infinite pleasure and pride to me, if, upon this occasion I could have followed upon the footsteps of my predecessors, and delivered a Presidential address to you, but unfortunately a late serious illness has left me incapable of the effort, and I am compelled to satisfy myself with a few homely remarks and an expression of my sense of the honour you have done me, of the great kindness and forbearance I have ever received from you and the support you have invariably given me. I cannot, however, allow this, the Centennial year of the Colony to pass without endeavouring to briefly summarise the steps by which the Royal Society of New South Wales has risen to its present position.

The first attempt to establish science in Sydney appears to have been in 1821, when a Society termed the Philosophical Society of Australasia, was formed with ten members under the presidency of that most indefatigable man and scientist Sir Thomas Brisbane. This apparently had a short life, as although some excellent papers were read at its meetings no mention is made of it after 1825. An attempt at its resuscitation was probably made in the year 1832—although but little record is left concerning it. In 1850 a more successful effort was made to bring similar materials together under the title of the Australian Philosophical Society; this commenced under more favourable auspices, but was soon strangled by the Gold mania. In 1855 it made a fresh start under the name of the Philosophical Society of New South Wales, and it was at this date that I became first associated with it. I recall with pleasure these days, when during the Governorship of Sir

William T. Denison and his presidency of the Society I had the honour of acting as its Honorary Secretary. We had then to struggle with difficulties, such as only occur in the earliest attempts to organise science in a young community in which the circumstances of life required devotion of the energies of all classes to the essentials of existences and the development of the first principles of Government. It was however, also a period in which the more thoughtful of the community were awakening to the advantages to be attained by the cultivation of science and its application to the varied and special features of the Colony.

At this critical time the training and special qualifications of the Governor General and President, Sir William T. Denison, the deep interest he took in the young Society, aided by the kind geniality of his disposition, were of the greatest assistance. Always ready to provide papers when asked, he usually selected practical subjects adapted to the circumstances of the community and calculated to develope the resources of the country.

It is evident that during the Presidency of Sir William T. Denison, the Society quickly attained a considerable amount of popularity, for we find that in 1856 ninety-one new members were elected, and its income amounted to £316. Of course this sudden prosperity could not last, and gradually gave way to varying but increasing depression until in 1866, the income had fallen to £43, and it became a question whether the Society could be carried on. Although notwithstanding the depressing vicissitudes, a large number of valuable papers had been read, and a microscopical section had been formed and conversaziones established.

In 1866 the name was changed to "Royal Society of New South Wales," and an improvement gradually took place in its circumstances. In 1875, Prof. Liversidge and Dr. Leibius were appointed Honorary Secretaries, and in that year the Society rented the building in which we meet, and which it has since purchased. From this date and through the zeal and indefatigable labours of these gentlemen, the Society has become more and more prosperous. I believe I am correct in saying that from this date

also it has steadily progressed towards its present position of popularity at home, and appreciation and honour abroad.

It is doubtless difficult to measure the exact amount of good which has been accomplished up to the present time, but we know the primary difficulties have been overcome, and that there is every reason to believe the future work of the Society will be increasingly productive of practical good, equally in the interests of pure and applied science. Many men have through it been stimulated to think and work with enthusiasm, and it has been well and permanently organised.

It is to be hoped that the improvements made in the teaching of science at the University may have a beneficial effect upon the progress of science in Australia, since but a comparatively few of the rising generation have had the necessary training to enable them to take part in scientific investigations—certain branches of science are now made optional subjects in the second and third years of the B.A. course; the Science and Engineering courses are to be extended to three years instead of being squeezed into two years as heretofore; and a preliminary year of instruction and training in scientific subjects has been provided for medical students, so that they may be better fitted to enter upon the study of the more professional branches of the medical curriculum.

It is evident that in a young community like ours, possessing great and almost unknown mineral and other resources requiring for their development the skilful application of science, it is necessary that a Society devoted to the cultivation of science in a comparatively small community must have a wider sphere of action and deal with more subjects than in an older and larger community where each branch can be dealt with by its separate Association. With the view of extending the work of the Society in various branches of Science, provision was made in 1876 for the formation of Sections, each with its own Chairman, Secretary, and Managing Committee. For the first few years the following Committees met regularly, and did much useful work, but as time went on

some of them gradually declined, and at present are not in active work, although there is no reason to suppose that they will not again take their part in the work of the Society. The Sections are as follows :—

Section A.—Astronomy, Meteorology, Physics, Mathematics, and Mechanics.

Section B.—Chemistry and Mineralogy, and their application to the Arts and Agriculture.

Section C.—Geology and Palæontology.

Section D.—Biology, *i. e.*, Botany and Zoology, including Entomology.

Section E.—Microscopical Science.

Section F.—Geography and Ethnology.

Section G.—Literature and Fine Arts, including Architecture.

Section H.—Medical.

Section I.—Sanitary and Social Science and Statistics.

In framing the rules for the formation of the sections the intention was that members of kindred tastes should have opportunities to meet together with fewer formalities and at more frequent intervals than at the General Meetings of the whole Society, for the exchange of ideas, information and experience upon topics of mutual interest, rather than for the reading and discussion of long and elaborate papers.

The great increase in the number of members and the greater popularity and usefulness of the Society dates from and was doubtless due to the formation of these sections, for prior to their establishment and the other changes which were made at the same time, the effective membership of the Society was probably less than 100 ; it is evident therefore, that the meetings of the sections presented attractions to many for whom the general meetings had but little interest.

In order that the Society should be able to hold property, and to place it upon a firmer and more permanent basis, an Act of Parliament was obtained in 1881 for its incorporation so that it now has perpetual succession as a body corporate.

In the same year the system of offering the Society's medal and a money prize of £25 for original researches was instituted. Although the Society has not been able to award its medal for all the thirty-six specified subjects, which have been announced from time to time, there have been several original communications of sufficient merit, and in cases where the papers have not come up to the requisite standard, it is felt that much good has been done by directing attention to certain specified matters requiring investigation, and it is hoped that when the same subjects are again offered, as they will be in due course, papers of sufficient merit will be forthcoming, inasmuch as the subjects chosen, are, as far as possible, such as are likely to be of interest and value to the community.

During the last twelve or thirteen years special attention has been paid to the formation of a library of scientific periodicals, and efforts have been made to obtain complete sets of the Journals and Transactions of Scientific Societies and Institutions in other parts of the world both by exchange and purchase; on account of the comprehensive character of this Society, it was felt that no other institution in Sydney was so well fitted to do it, being prepared, as it is, to take papers upon almost all branches of knowledge. Accordingly the Society has spared no effort to make its library as complete as possible in this respect, and it has, considering its limited means, spent large sums for this purpose. As a reward it has now probably one of the best collections of scientific periodical literature in Australia.

This of course, has not been done without some sacrifice, and although it may justly be urged that the Society's library is but poorly stocked with ordinary new books, this is a matter of less importance, since new books usually become cheaper before they become dearer, whereas to procure complete series becomes more difficult and costly from year to year; there are also several libraries in Sydney at which the ordinary run of modern books upon scientific subjects can be easily consulted by our members. It may be said that in 1874 we had no library, for the few books

which had been presented to us had been handed over to the care of the Australian Museum, as we had no home of our own, they became merged in the library belonging to the Museum, and all efforts to trace and recover them were without avail; but since the Society is making exchanges with some 350 Societies and Institutions in all parts of the world, the annual increase to its library of journals and transactions is very great, and starting from 0 in 1874, the library now shews a total, in round numbers, of some 5,000 bound books and a very large number of unbound books and pamphlets.

With this cursory glance at a few points in the history of our Society prior to the Centennial year of the Colony, we now find it through the instrumentality of one of its Honorary Secretaries, Professor Liversidge, acting as the starting point from which the "Australasian Society for the Advancement of Science" has been established.

Having been prevented, by the state of my health, from taking an active part in this important Scientific Congress, I am unable to describe, from personal observation, the various sectional meetings, excursions, &c., which took place during the first meeting of the Association held in Sydney during the past year. It is fitting however, that I should place on record a brief epitome of its development and inauguration in this city. I am indebted for, and have epitomised the following facts from the very able address of its President:—

"Up to the year 1831 no organised Association for the promotion of Science had existed in Great Britain. In that year, however, Mr. (afterwards 'Sir') David Brewster, supported by Sir Roderick Murchison, Sir John Herschel and others, initiated the first Association for the advancement of Science. The first meeting was held in York, when 353 persons were present. It has since won the confidence of various Governments who have adopted and acted upon its recommendations, and regularly placed in its keeping sums of money for the promotion of Science. Its subse-

quent progress is the history of the advancement of Science during the last fifty-eight years.

"During this time perhaps nothing is more striking than the wide scope and practical utility of its work. Such varied subjects as the shooting stars, the science of ship building, underground drainage and the most intricate chemical questions, received equal attention, and had additional light thrown upon them under its influence ; while hundreds of other subjects, scientific and practical were throughly investigated by the voluntary labours of its members.

"By having its meetings in different towns of Great Britain, it made their men of science personally known to each other, and as it were focussed science, and at the same time rendered its own machinery easily guided from the central point. In 1883, or 1884, it held its meeting in Montreal, and at this it was suggested that on some future occasion it should be held in Australia. This idea had previously occurred to Professor Liversidge in 1872, who seeing the impossibility of carrying it out at that time, owing to the length and cost of the voyage &c., turned the opportunity to advantage in 1886 by advocating the preliminary, practical, and important step of establishing in the meanwhile an "Australian Association for the Advancement of Science."

"From this date, the question appears never to have been absent from the mind of Professor Liversidge, but was carefully introduced by him to the Public at every favourable opportunity, until finally his efforts were, as we know, brought to a successful issue during the Centennial year."

Although, as I have already stated, I was prevented by the state of my health from taking an active part in this important festival, and am unable therefore to describe from personal observation, the interesting meetings and excursions which took place, I know that it was an eminent success, and that it was attended by delegates and others of high scientific reputation from all the Colonies who collectively formed a body of men ably

representing the talent of the Australasian Universities and Scientific Societies.

Failing my personal observation, I again avail myself of the most interesting address of the President. From this I find that in July 1886, Professor Liversidge wrote to the Presidents of the various Australasian Scientific Societies inviting them to appoint members of their Councils to represent them at a meeting to be held in Sydney at an early date. This meeting subsequently took place, drafted rules for the Association, and arranged that the first meeting should take place in Sydney in September 1888. Under his active supervision and quidance the work of organisation was carried on, and in March 1888, the delegates were called together. At this meeting they elected H. C. Russell, B.A., F.R.S., President; Professor Liversidge and Dr. George Bennett, F.L.S., Honorary Secretaries; and Sir Edward Strickland, K.C.B., Honorary Treasurer. At subsequent meetings Vice-Presidents, Presidents and Secretaries of Sections were appointed, and every effort was made to found the Association upon a broad basis. These efforts were so successful that the President was able in his opening address to announce that the members numbered no less than 750,* and to express his belief "that the Association had acquired an impulse which in the course of time would lead it on to the realization of its purpose."

Sectional Committees were appointed for the following subjects:
Section A.—Astronomy, Mathematics, Physics, and Mechanics.
Section B.—Chemistry and Mineralogy.
Section C.—Geology and Palæontology.
Section D.—Biology.
Section E.—Geography.
Section F.—Economic and Social Science and Statistics.
Section G.—Anthropology.
Section H.—Sanitary Science and Hygiene.
Section I.—Literature and Fine Arts.
Section J.—Architecture and Engineering.

* The number rose to 851 during the meeting.

The first General Meeting was held in the Great Hall of the University, on Tuesday, 28th August, at 8·30 p.m., when His Excellency the Governor took the Chair, and the President delivered an address.

The Sectional Committees assembled in the rooms set apart for their use at the University, at 10·30 a.m. each day, until the conclusion of the meeting.

The Sections met at the University at 11 a.m., for the reading and discussion of papers.

The following Presidential Addresses were delivered at 11 a.m. on Wednesday, 22th August :—

Section A.—Astronomy, Mathematics, Physics and Mechanics, by Mr. R. L. J. Ellery, F.R.S., F.R.A.S.

Section C.—Geology and Palæontology, Mr. R. L. Jack, F.G.S.

Section D.—Biology, by Professor Tate, F.G.S., F.L.S.

Section F.—Economic and Social Science and Statistics, by Mr. H. H. Hayter, C.M.G.

The following Presidential Addresses were delivered at 11 a.m. on Thursday, 30th August :—

Section B.—Chemistry and Mineralogy, by Professor Black, M.A., D.Sc.

Section E.—Geography, by Hon. John Forrest, C.M.G.

Section G.—Anthropology, by Dr. Carroll, M.A.

Section H.—Sanitary Science and Hygiene, by Dr. Bancroft.

Section I.—Literature and the Fine Arts, by Prof. Boulger, M.A.

Section J.—Architecture and Engineering, by Professor Kernot M.A., C.E.

The afternoons were kept as free as possible for visits to places of interest, Public Institutions, Botanical, Dredging, and other Excursions.

The following popular Scientific Lectures were delivered in the Great Hall of the University :—

Thursday, 30th August, at 8 p.m., "On the Volcanic Eruptions in the Hot Lake District of New Zealand," by Sir James Hector, K.C.M.G., F.R.S.

Friday, 31st August, at 8 p.m., "On recent discoveries on the Pineal Eye," by Professor Baldwin Spencer.

The railway authorities of South Australia, Victoria and New South Wales agreed to issue return tickets at single fares, to members of the Association travelling by railway from other Colonies to attend the General Meeting, and the following steamship companies undertook to convey members to Sydney and back at a reduction of 20 per cent. on the ordinary rates:—Australian United Steam Navigation Company; Messrs. Wm. Howard Smith and Sons, Limited; Messrs. Huddart Parker and Co.; Adelaide Steamship Co. The Union Steamship Co. carried members at excursion rates.

The titles of the 110 papers read and the lectures delivered indicate that the work done was eminently useful and interesting; and it must be a source of great satisfaction to this Society that the meeting went off with unclouded success, afforded much pleasure to a large number of the best class of minds, by affording them an opportunity of interchanging thought with kindred spirits and generally stimulated the spirit of scientific enterprise.

I must not fail to mention here, that the annual Conversazione of this Society was arranged to take place at the termination of the Association's Proceedings. It was held in the Great Hall of the University, on the 5th September, under the management of a Committee composed of the President, Sir Alfred Roberts, H. C. Russell, B.A., F.R.S., one of the Vice-Presidents, the Hon. Secretaries, Prof. Liversidge, M.A., F.R.S., and F. B. Kyngdon, and Messrs. Charles Moore, F.L.S., P. R. Pedley, Dr. Leibius, M.A., Prof. Threlfall, M.A., and Prof. Warren, M. Inst. C.E.

The Hall and the approaches were artistically decorated with flags, shields, and festoons of greenery, and Mr. Charles Moore, Director of the Botanic Gardens, kindly furnished a supply of palms, ferns, and rare pot-plants.

The Physical Laboratory was thrown open, and experiments were conducted by Prof. Threlfall and Mr. John F. Adair, also the Medical School of Prof. Anderson Stuart and the Mechanical

Laboratories and workshops, where the large testing machine was exhibited in work by Prof. Warren.

The Macleay Museum and the various Lecture Rooms, were also thrown open to the guests.

Mr. F. Morley presided at the organ, and select pieces were played at intervals.

The number of guests present was about 1,500, the unusually large gathering being due to the fact that invitation cards had been issued to the members of the Australasian Association for the Advancement of Science, the Inaugural Meeting of which had just closed.

Impressed as I am with the importance of this movement, I deeply regret being compelled to deal with it in this very meagre and cursory manner; but I must pass on to note the work done by the various sections of the Society during the past year.

In the Medical Section, seven meetings were held, at which the attendance was far above the previous average. The papers read and the specimens exhibited were also interesting and valuable. Dr. Knaggs was elected Chairman, and Dr. MacCormick and Dr. Jenkins Secretaries. This Section is gradually developing a better form of work, and I look eagerly forward to the time when the strain upon the physical and mental powers of its members, caused by the arduous duties of general practice, will be diminished and they will be enabled to devote more time and greater energy to original research. I feel confident also that the stimulus given by the meeting of the Association for the Advancement of Science and the very successful Medical Congress held in Melbourne last year, will beneficially affect this section, which is destined to take a first place in its special branch of Scientific Research.

I regret to observe that the Sanitary Section has not yet assumed the position which the vital importance of the subject requires. It is unfortunate that in this the early stage of the development of Scientific Hygiene, it has often to work against the unpopularity of the term "Sanitary Reform," which by too

many persons is associated with Inspectors of Nuisances and plumber's work. It will not however be denied that the aims of medical and sanitary science, or hygiene, are the reduction of the rate of mortality by the prevention of disease, and the improvement of the physique of mankind, both of which must be mainly attained through hygiene, based upon scientific principles. When I look round and observe the terrible ravages of typhoid, diphtheria and other preventible diseases, the deplorable ignorance which apparently exists among us, and the melancholy apathy with which these evils are tolerated, I can but feel that instead of being our weakest, this should be our strongest section, and I venture, to suggest that closely related as this subject is to medical science, it should in some way be associated and co-operate with it.

The microscopical section has done much good work, and its members display an energy and interest wihch augur well for the future success of the section.

The Treasurer has kindly furnished me with the following particulars of the present condition of the Society :—The number of ordinary members of the Society on the 1st May, 1888, was 482. Twenty new members were elected during the past session, and one was transferred from the list of corresponding members. Against this increase the Society has to regret the loss of seven members by death, eight resigned, and fourteen were struck off the roll in accordance with Rule XIV., so that the present total is 474, being a decrease of eight since the beginning of last session.

The income of the Society has been fully maintained, owing to the greater number of members paying the increased subscription of two guineas, and the liberality of the Government and Legislature, who in consequence of the withdrawal of the free printing of the Society's proceedings, have generously increased the annual subsidy to a maximum of £500 instead of £400, on the condition of £1 for every £1 being subscribed by the members.

The gross receipts were £1,356 16s. 4d., of which £63 was for entrance and composition fees, and about £45 for repayments for

freight and other disbursements. The expenditure was unusually heavy, and amounted to £1,304 4s. 7d., including £137 for the Conversazione, and £100 for the book cases in the hall and library. The cost of the Society's Journal was also great, being no less than £246.

After transferring £107 2s. to the Building and Investment Fund, there remained a balance of £5 8s. 3d. to carry forward to the new session.

The sum to the credit of the Building and Investment Fund is £514 3s. 1d., and the Clarke Memorial Fund now amounts to £276 11s. 4d., of which, however, £30 4s. 9d. is still due from the liquidator of the Oriental Bank. These sums are invested as fixed deposits in the Union Bank at five per cent. per annum interest.

The balance of the Smith Memorial Fund amounting to £9 0s. 10d. was spent in the purchase of photographs, which were sent to all the subscribers. In addition to the Reserve Fund of over £500, the Society possesses the premises in which we are now assembled together with the furniture and effects, and a very valuable library. There are no liabilities whatever beyond the current expenses.

During the past session the Society held seven Monthly Meetings at which the following papers were read :—

May 2, 1888.—Presidential Address. By C. S. Wilkinson, F.G.S.

June 6—Forest Destruction in N.S.W. and its effects on the flow of water in watercourses and on the rainfall. By W. E. Abbot, Wingen.

„ On the increasing magnitude of Eta Argus. By H. C. Russell, B.A., F.R.S.

„ Notes on some minerals and mineral localities in the Northern districts of New South Wales. By D. A. Porter, Tamworth.

„ On a simple plan of Easing Railway Curves. By Walter Shellshear, A.M.I.C.E.

June 6—On the Anatomy and Life History of Mollusca peculiar to Australia. By the Rev. J. E. Tenison-Woods, F.G.S.

July 4—An improvement in Anemometers. By H. C. Russell, B.A., F.R.S.

Aug. 1—Description of an Autographic Stress-strain Apparatus. By Professor Warren, M. Inst. C.E.

Oct. 3—Considerations of Phytographic Expressions and Arrangements. By Baron Ferd. von Mueller, K.C.M.G., F.R.S.

" Indigenous Australian Forage Plants (Non-Grasses), including plants injurious to stock. By J. H. Maiden, F.L.S.

" Census of the Fauna of the Older Tertiary of Australia. By Prof. Ralph Tate, F.G.S.

" The Storm of 21st September, 1888. By H. C. Russell, B.A., F.R.S.

" Some New South Wales Tan-substances. (Part V.) By J. H. Maiden, F.L.S.

Nov. 7—Results of Observations of Comets I. and II., 1888, at Windsor, N.S.W. By John Tebbutt, F.R.A.S.

" The Desert Sandstone. By the Rev. J. E. Tenison-Woods, F.G.S.

" On a new self-recording Thermometer. By H. C. Russell, B.A., F.R.S.

" The Thunderstorm of 26th October, 1888. By H. C. Russell, B.A., F.R.S.

Decr. 5—The Latin verb *Jubere*, a linguistic study. By John Fraser, B.A., LL.D.

" Notes on some New South Wales Minerals (Note No. 5). By Professor Liversidge, M.A., F.R.S.

At the Council Meeting held 28th November, 1888, it was unanimously resolved to award the Clarke Medal for the year 1889 to R. L. J. Ellery, F.R.S., Government Astronomer of Victoria.

At its meeting on 30th May, 1888, the Council awarded the prize of £25 and the Society's Medal, which had been offered for the best communication on the "Anatomy and Life History of Mollusca peculiar to Australia," to the Rev. J. E. Tenison-Woods, F.G.S., F.L.S.

The Council has since issued the following list of subjects with the offer of the Society's Bronze Medal and a prize of £25, for each of the best researches, if of sufficient merit :—

Series X.—To be sent in not later than 1st May, 1891.

No. 34.—The Meteorology of Australia, New Zealand, and Tasmania.

No. 35.—Anatomy and Life History of the Echidna and Platypus.

No. 36.—The Microscopic structure of Australian Rocks.

During the year the Society has subscribed to 45 Scientific Journals and Periodicals, and has purchased 55 volumes at a cost of £68 12s. 3d., including a copy (text only) of the "Geology of the United States Exploring Expedition during the years 1828—1842, under the command of Charles Wilkes, U.S.N., by James D. Dana, A.M." This is believed to be the only copy in New South Wales, and was procured through the kind intervention of the Smithsonian Institution, Washington.

The donations to the library during the past year have been as follows :—1,205 Volumes, Parts and Pamphlets ; 3 Portfolios of Charts ; 22 Loose Charts ; 11 Photographs ; Objective for Microscope $2\frac{1}{2}$ inch, and a Powell & Lealand's $\frac{1}{12}$ Micro-objective N.A. 1·5.

The following is a brief summary of the Essay by the Rev. J. E. Tenison-Woods. for which the Society's Bronze Medal and £25 were awarded.

Of the premiums offered by the Society for original essays that for the essay on "Anatomy and Life History of Mollusca peculiar to Australia," was awarded to the Rev. J. E. Tenison-Woods. The essay deals with many subjects, including new and important observations on the organs of respiration, circulation and develop-

ment of well-known species of mollusca from Port Jackson and Botany Bay.

The author relates the discovery of red blood in two of the species *Arca trapezia* and *Solen loanii*, which is the more interesting as the same exceptional peculiarity exists in a British species of *Solen*, and an American species of *Arca*. There is also an account of the microscopic examination of the gill apparatus of the rock oyster, *Ostrea mordax*, from which it appears that the ova of oysters are nursed in the gill-chambers until they are hatched a fact of great importance in oyster cultivation. Other new facts in Australian molluscan life are detailed, which are too numerous for separate mention.

One matter, however, which occupies the greater portion of the paper, is the discovery of sense organs, especially eyes in the shells and opercula, as well as similar developments in the soft tissues.

The observations of Dr. Semper and Professor Mosley on these organs are considerably extended by the author, who draws conclusions which must, if correct, cause a change in the present classification of Australian mollusca. He states that he has discovered eyes and sense organs in numbers equal to any recorded in several genera, such as limpets (*Patella*, *Acmæa*, *Siphonaria*, *Scutus*, &c.), periwinkles (*Littorina*, *Risella*, *Nerita*, &c.), and others, amongst the univalves; and in *Ansiina*, *Lima*, *Arca*, and *Trigonia* amongst the bivalves.

But the most singular part of the investigations is that which refers to the genus *Trigonia*. The author finds that each of the outer surfaces of *Trigonia lamarckii* has a facetted structure like the eye of a fly, and each of the facets has a cornea, lens, retina, and optic nerve.

Viewed under the microscope, the outer surface shows ribs and raised tubercles, on each portion of which there is a pavement of brilliantly-refracting eyes as small and as close as those of an insect. A section of the shell shows the nerves of these organs uniting in what the author believes to be a large nervous centre or brain. From this other large nerves are given off, so that the

soft tissues of the animal are supplied from it, and are connected with the valve by nerve strands at the muscular scars. The author, therefore, regards the valves of *Trigonia* as brain-case containing sense-organs above, the brain in the centre, and the nerves supplying the soft organs inside.

If these conclusions are correct, they are of startling importance. The bivalve shells are classified as having no brain, and a very small nervous system in the soft tissues. It is now claimed for them to have a large brain and nervous system. They are superior to the univalves, in which one of the valves is represented by the operculum. No doubt the paper will evoke much attention from comparative anatomists.

Another important paper by the same author, on the Desert Sandstone, occupies a considerable portion of the year's proceedings. The author describes the Desert Sandstone as a formation spread more or less over the whole extent of the Australian Continent. It has been a great puzzle to all geologists, principally on account of its broken character, peculiar stratification, and the absence of any fossils. The author regards it entirely as a volcanic ash, and as belonging exclusively to the tertiary volcanic emanations. The evidences upon which these conclusions are built up are partly the microscopic appearances of the sands, and partly geological considerations, for which the paper itself must be consulted, and on which it gives ample detail.

I trust, gentlemen, that, for the reasons above stated, you will kindly accept of these few words in place of a presidential address, and that you will permit me to reiterate my warm thanks for the honour of having been elected to hold the high office of President of your Society, as well as for the great kindness and consideration you have at all times shown me.

Assuring you of the pleasure it has been to me to enjoy your universal kindness and consideration, I will now, in retiring from the Chair, offer the Society the best wishes of an old friend for its future success, and introduce your President for 1889.

PROCEEDINGS

OF THE

ROYAL SOCIETY OF NEW SOUTH WALES.

WEDNESDAY, MAY 1, 1889.

ANNUAL GENERAL MEETING.

Sir ALFRED ROBERTS, President, in the Chair.

The minutes of the preceding meeting were read and confirmed.

The following Financial Statement for the year ending 31st March, 1889, was presented by the Hon. Treasurer and adopted:—

GENERAL ACCOUNT.

RECEIPTS.	£	s.	d.	£	s.	d.
Subscriptions { One Guinea	243	12	0			
Two Guineas	371	14	0			
Arrears	29	8	0			
Advances	6	6	0	651	0	0
Entrance and Composition Fees				63	0	0
Parliamentary Grant on Subscriptions received during 1889				500	0	0
Rent of Hall				97	16	0
Repayment of advances—						
For Books, Freight, and Charges ...	26	14	9			
Australasian Association for the Advancement of Science	18	5	7			
				45	0	4
Total Receipts				£1,356	16	4
Balance on 1st April, 1888				59	18	6
				£1416	14	10

PAYMENTS.	£	s.	d.	£	s.	d.
Advertisements	29	1	0			
Assistant Secretary	250	0	0			
Books and Periodicals	180	3	1			
Bookbinding	64	0	2			
Conversazione	137	5	0			
Freight, Charges, Packing &c.	12	12	0			
Furniture and Effects	116	4	11			
Gas	17	8	0			
Housekeeper	10	0	0			
Carried forward	816	14	2			

PAYMENTS—*continued.*	£	s.	d.	£	s.	d.
Brought forward	816	14	2			
Insurance	6	8	9			
Petty Cash Expenses	15	1	3			
Postage and Duty Stamps	37	0	0			
Printing	26	0	0			
Printing and Publishing Journal	246	6	0			
Prize Essay Award	25	0	0			
Rates	28	2	6			
Refreshments &c., at Meetings	11	1	0			
Repairs	51	3	1			
Stationery	7	10	2			
Sundries	33	17	8			
Total Payments ...				1,304	4	7
Transfer to Building and Investment Fund				107	2	0
Balance on 31st March, 1889				5	8	3
				£1,416	14	10

AUDITED—P. N. TREBECK.
H. O. WALKER.
SYDNEY, 16th April, 1889.

ROBERT HUNT, *Honorary Treasurer.*
W. H. WEBB, *Assistant Secre'ary.*

BUILDING AND INVESTMENT FUND.

RECEIPTS.	£	s.	d.	£	s.	d.
Donations	7	2	0			
Interest on Fixed Deposit	15	8	0			
Total Receipts				22	10	0
Transfer from General Account				107	2	0
Balance on 1st April, 1888				384	11	1
				£514	3	1

	£	s.	d.
Fixed Deposit in Union Bank	514	3	1
	£514	3	1

AUDITED—P. N. TREBECK.
H. O. WALKER.
SYDNEY, 16th April, 1889.

ROBERT HUNT, *Honorary Treasurer.*
W. H. WEBB, *Assistant Secretary.*

CLARKE MEMORIAL FUND.

	£	s.	d.
Amount of Fund on 1st April, 1888	267	1	9
Interest accrued to 31st March, 1889	9	9	7
	£276	11	4

	£	s.	d.
Fixed Deposit in Union Bank	246	6	7
Balance due from Oriental Bank	30	4	9
	£276	11	4

AUDITED—P. N. TREBECK.
H. O. WALKER.
SYDNEY, 16th April, 1889.

ROBERT HUNT, *Honorary Treasurer.*
W. H. WEBB, *Assistant Secretary.*

SMITH MEMORIAL FUND.

Balance of Fund on 1st April, 1888	£9	0	10
Photographs and Circulars to Subscribers	£9	0	10

AUDITED—P. N. TREBECK.
H. O. WALKER.

ROBERT HUNT, *Honorary Treasurer.*
W. H. WEBB, *Assistant Secretary.*

SYDNEY, 16th April, 1889.

Messrs. J. H. Maiden and D. M. Maitland were elected Scrutineers for the election of officers and members of Council.

A ballot was then taken and the following gentlemen were duly elected officers and members of Council for the current year :—

Honorary President:
HIS EXCELLENCY THE RIGHT HON. LORD CARRINGTON, G.C.M.G.

President:
PROF. LIVERSIDGE, M.A., F.R.S., &C.

Vice-Presidents:
SIR ALFRED ROBERTS. | P. R. PEDLEY.

Hon. Treasurer:
ROBERT HUNT, C.M.G., F.G.S.

Hon. Secretaries:
F. B. KYNGDON. | PROF. WARREN, M.I.C.E.

Members of Council:
W. A. DIXON, F.C.S., &C.
A. LEIBIUS, PH. D., M.A., F.C.S.
CHARLES MOORE, F.L.S.
H. C. RUSSELL, B.A., F.R.S.
PROF. ANDERSON STUART, M.D.
H. G. A. WRIGHT, M.R.C.S.E., &C.

The following gentlemen were duly elected ordinary members of the Society :—

Kowalski, H., Petersham.
Mestayer, R. L., M.I.C.E., F.R.M.S. ; Sydney.

The certificates of two new candidates were read for the second time, and of one for the first time.

The names of the Committee-men of the different Sections were announced, viz. :—

MEDICAL SECTION.
Chairman ... Dr. Crago.
Secretaries .. Dr. MacCormick and Dr. Jenkins.
Committee... Dr. P. Sydney Jones, Dr. W. H. Goode, Dr. E. Fairfax Ross, Dr. W. Chisholm, Dr. Alfred Shewin, Dr. Knaggs.

Meetings held on the Third Friday in each month, at 8 15 p.m.

MICROSCOPICAL SECTION.
Chairman ... S. MacDonnell.
Secretary ... Percy J. Edmunds.
Committee... H. G. A. Wright, M.R.C.S.E., A. P. Bedford, T. Brindley, and T. Whitelegge.

Meetings held on the Second Monday in each month at 8 p.m.

The following letters were read; from R. L. J. Ellery, F.R.S., &c., acknowledging the award of the Clarke Medal for 1889, and from Prof. Ralph Tate, F.G.S., and Capt. F. W. Hutton, F.G.S., acknowledging their election as Honorary Members of the Society:

Observatory, Melbourne,
January 7th, 1889.

My dear Sir,—I have to acknowledge your letter of the 14th December, accompanied by the Clarke Memorial Medal which has been awarded me by the Council of the Royal Society of New South Wales.

Will you kindly convey to the Council my sincere thanks and my great appreciation of the honour it has done me in awarding me this medal, and of its expression of consideration for my services in the cause of Australian Science.

I am, my dear Sir,
Yours faithfully,
ROB. L. J. ELLERY.

The Hon. Secretary of the Royal Society Sydney.

The University, Adelaide,
December 10th, 1888.

My dear Sir,—I beg you to convey to your Council and members of the Society my grateful thanks of their high appreciation of my scientific labours by electing me an Honorary Member.

It will be my greatest endeavour to justify this high distinction and to further to the best of my ability and opportunities the interest of the Society.

Yours truly,
RALPH TATE.

To Prof. Liversidge,
Hon. Sec., Royal Society of New South Wales.

Canterbury College, Christchurch, N.Z.
18th December, 1888.

Gentlemen,—I was much surprised and, of course, much pleased to get your letter of the 7th instant, informing me that I had been elected an Honorary Member of the Royal Society of New South Wales. Please convey to the Council my very best thanks for the honour they have done me; which I esteem most highly.

Every worker, I suppose, feels occasionally that he has not done so much, or so well, as he ought to have done, but a kindly act like this encourages him to go on, for he feels that others, well fitted to judge. think that his work has been useful.

I am, Gentlemen,
Your obedient servant,
F. W. HUTTON.

The Hon. Secretaries, Royal Society of N.S. Wales.

Sir Alfred Roberts, President, then read his address.

A vote of thanks was passed to the retiring President, and Professor Liversidge, M.A., F.R.S., was installed as President for the ensuing year.

The following donations received since the last meeting were laid upon the table:—

List of Donations Received from the 6th December, 1888, to the 30th April, 1889, inclusive.

(The Names of the Donors are in *Italics.*)

TRANSACTIONS, JOURNALS, REPORTS, &c.

Amsterdam—Académie Royale des Sciénces. Verslagen en Mededeelingen der Koninklijke Akademie van Wetenschappen. Afdeeling Natuurkunde, Derde Reeks, Deel iii. and iv., 1887 and 1888. Jaarboek, voor 1886 and 1887. *The Society.*

Société Royale de Zoologie. Bijdragen tot de Dierkunde, Aflevering 14, 15. (Gedeelte i. and ii.) 16, 1888. Feest-Nummer 1888. ,,

Auckland—Auckland Institute and Museum. Report for 1888-89. *The Institute.*

Baltimore—Johns Hopkins University. American Chemical Journal, Vol. ix., Nos. 3—6; Vol. x., Nos. 1 and 2. American Journal of Mathematics, Vol. x., Nos. 1 and 2. American Journal of Philology, Vol. viii., Nos. 2, 3, and 4. Observations on the Embryology of Insects and Arachnids, by Adam Todd Bruce, Ph.D., 1887, (A Memorial Volume). Studies from the Biological Laboratory, Vol. iv., Nos. 1 and 2. Studies in Historical and Political Science, Fifth Series, Nos. 8—12, 1887. Taxation in American States and Cities, by Richard T. Ely, Ph.D. University Circulars, Vol. vi., Nos. 58—64, 1887-88. *The University.*

Bergen—Museum. Aarsberetning for 1889. *The Museum.*

Berlin—Königlich Preussisches Akademie der Wissenschaften. Sitzungsberichte, Nos. 21—37, 26 April —26 July, 1888. *The Academy.*

Königlich Preussisches Meteorologisches Institut. Instruktion für die Beobachter an den Meteorologischen Stationen ii., iii., und iv., Ordnung, 1881. *The Director.*

Bonn—Naturhistorischer Vereines der Preussischen Rheinlande, Westfalens und des Reg.-Bezirks Osnabrück. Verhandlungen.

Jahrgang,	xxxii.,	Folge	4,	Band	ii.,	Hälfte	2, 1875.
,,	xxxiii.,	,,	4,	,,	iii.,	,,	1, 1876.
,,	xxxvii.,	,,	4,	,,	vii.,	,,	2, 1880.
,,	xxxviii.,	,,	4,	,,	viii.,	,,	1, 1881.
,,	xxxix.,	,,	4,	,,	ix.,	,,	1, 1882.
,,	xliii.,	,,	5,	,,	iii.,	,,	1, 1886.
,,	xlv.,	,,	5,	,,	v.,	,,	1, 2, 1888. *The Society.*

Boston, (Mass. U.S.A.)—American Academy of Arts and Sciences. Proceedings, New Series, Vol. xv. Whole Series, Vol. xxiii., Part i., 1887-88. *The Academy.*

Boston Society of Natural History. Memoirs, Vol. iv., Nos. 1—6, 1886-88. *The Society.*

Brisbane—Royal Geographical Society of Australasia. Proceedings and Transactions of the Queensland Branch, 3rd Session, Vol. iii., Part ii., 1887-8. ,,

Royal Society of Queensland. Proceedings, Vol. iv., Vol. v., Parts ii. and iv., Vol. vi., Part i. ,,

CALCUTTA—Asiatic Society of Bengal. Journal, Vol. LVII., Part i., Nos. 1 and 2, Part ii., Nos. 2 and 3, 1888. Proceedings, Nos. 4—8, 1888. *The Society.*

Geological Survey of India. A Bibliography of Indian Geology: being a list of books and papers, relating to the Geology of British India and adjoining Countries, published previous to the end of A.D. 1887.—Preliminary issue. Records of the Geological Survey of India, Vol. XXI., Part iv., 1888; Vol. XXII., Part i., 1889. *The Director of the Survey.*

CAMBRIDGE (Mass.)—Cambridge Entomological Club. *Psyche,* Vol. V., Nos. 149—153, 1888-9. *The Club.*

Museum of Comparative Zoölogy, at Harvard College. Annual Report of the Trustees, 1861, 1870—73. Annual Report of the Curator, 1887-88. Bulletin, Vol. I., Nos. 1—13; Vol. II., Nos. 2—5; Vols. XIV., XV., XVI., Nos. 1, 2, and 3; Vol. XVII., No. 2. Memoirs, Vols. I., II., V., VI., VII., VIII., No. 1; IX., No. 1; XV. *The Museum.*

CAMBRIDGE—Philosophical Society. Proceedings, Vol. VI., Part 4, 1888. *The Society.*

CAPE TOWN—South-African Philosophical Society. Transactions, Vol. IV., Parts i. and ii., 1884-8; Vol. V., Part i., 1888. ,,

CINCINNATI—Cincinnati Society of Natural History. Journal, Vol. XI., No. 1, April, 1888. (Memorial Number.) ,,

CORDOBA—Academia Nacional de Ciencias. Boletin, Tomo XI., Entrega 1 and 2, 1887-88. *The Academy.*

DRESDEN—K. Säch. Statistisches Bureau. Zeitschrift, Jahrgang XXXIII., Heft 3 and 4, 1887; Jahrgang XXXIV., Heft 1 and 2, 1888. *The Bureau.*

Vereins für Erdkunde. Festchrift zur Jubelfeier des 25 jahrigen Bestehens 1888. *The Society.*

EDINBURGH—Geological Society. Transactions, Vol. V., Part 4, 1888. ,,

Royal Scottish Geographical Society. *The Scottish Geographical Magazine,*" Vol. IV., Nos. 11 and 12, 1888; Vol. V., Nos. 1 and 2, 1889. ,,

FLORENCE—Società Africana d' Italia. Bullettino della Sezione Fiorentina, Vol. IV., Fasc. 7 and 8, 1888. ,,

Società Entomologica Italiana. Bullettino, Anno XX., Trimestri 1, 2, 3, and 4, 1888. ,,

Società Italiana di Antropologia, Etnologia e Psicologia Comparata. Archivio, Vol. XVIII., Fascicolo 2, 1888. ,,

FRANKFURT a/M.—Senckenbergische Naturforschende Gesellschaft. Abhandlungen, Band XV., Heft 3, 1888. Bericht, 1888. ,,

FREIBERG i S.—Naturwissenschaftlicher Vereins. Führer durch das Naturhistorische Museum zu Freiberg, 1888. Mittheilungen des Naturwissenschaftlichen Vereins, Heft 1, 1882. ,,

GLASGOW—Philosophical Society of Glasgow. Proceedings, Vol. XIX., 1887-88. *The Society.*
Geological Society of Glasgow. Transactions, Vol. VIII., Part ii., 1886-87, 1887-88. ,,

GÖTTINGEN—Königliche Gesellschaft der Wissenschaften und der Georg-Augusts- Universität zu Göttingen. Nachrichten aus dem Jahre 1887. ,,

HALIFAX (Nova Scotia)—Nova Scotian Institute of Natural Science. Proceedings and Transactions, Vol. VII., Part ii., 1887-88. *The Institute.*

HAMBURG—Deutsche Meteorologische Gesellschaft. *Meteorologische Zeitschrift*, Nov. and December, 1888, Jan. and Feb., 1889. *The Society.*

HARLEM—Société Hollandaise des Sciences. Archives Néerlandaises des Sciences Exactes et Naturelles, Tome XXIII., Livraison 1, 1888. ,,

HELSINGFORS—Société des Sciences de Finlande. Bidrag till Kännedom af Finlands Natur Och Folk; Häftet 44. Exploration Internationale de Régions Polaires 1882-1883 et 1883-1884. Expédition Polaire Finlandaise. ,,

HOBART—Royal Society of Tasmania. Abstract of Proceedings, November 13, 1888. ,,

JENA—Medicinisch-Naturwissenschaftliche Gesellschaft zu Jena. Jenaische Zeitschrift, Band XXII. N.F., Band XV., Heft. 3 and 4, 1888. ,,

LAUSANNE—Société Vaudoise des Sciences Naturelles. Bulletin, 3e Série, Vol. XXIV., No. 98, 1888. ,,

LEEDS—The Yorkshire College. Fourteenth Annual Report, 1887-8. *The College.*

LEIPZIG—Vereins für Erdkunde zu Leipzig. Mittheilungen 1887. *The Society.*

LIÉGE—Société Géologique de Belgique. Annales, Tome XIII., Tome XIV., Liv. 1, Tome XV., 1885-88. ,,
Société Royale des Sciences. Mémoires, Série 2, Tome XV., 1888. ,,

LONDON—Anthropological Institute of Great Britain and Ireland. Journal, Vol. XVIII., No. 2, 1888. *The Institute.*
Geological Society. Quarterly Journal, Vol. XLIV., No. 176, Vol. XLV., No. 177, 1888-89. *The Society.*
Iron and Steel Institute. Journal, No. 2, 1888. *The Institute.*
Linnean Society. Journal, Botany, Vol. XXIII., Nos. 156—157; Vol. XXIV., No. 164; Vol. XXV., Nos. 165—169. Zoology, Vol. XX., No. 121. List of Fellows, Session 1888—1889. *The Society.*
Meteorological Council. Contributions to our Knowledge of the Meteorology of the Arctic Regions, Part v., *Official No.* 34. Hourly Readings, Part iv, Oct.—Decr., 1885, *Official No.* 74. Meteorological Observations at Stations of the Second Order for the year 1884, *Official No.* 78. Report of the Meteorological Council to the Royal Society for the year ending 31 March, 1888. Weekly Weather Report, Second Series, Vol. v., Nos. 19—38 and Appendix 1, 1888. *The Council.*

LONDON—Mineralogical Society. The Mineralogical Magazine and Journal of the Mineralogical Society, Vol. VIII., No. 37, October, 1888. *The Society.*

Pharmaceutical Society of Great Britain. Calendar for 1889. Journal and Transactions, Vol. XIX., Parts 220—223, 1888-9. ,,

Physical Society, of London. Proceedings, Vol. IX., Part iv., October, 1888. ,,

Quekett Microscopical Club. Journal, Ser. II., Vol. III., No. 23, January, 1889. *The Club.*

Royal Asiatic Society of Great Britain and Ireland. Journal, New Series, Vol. XX., Part iv., Oct., 1888. *The Society.*

Royal Astronomical Society. Monthly Notices, Vol. XLVIII., No. 9, Supplementary Number, 1888. Vol. XLIX., Nos. 1, 2, and 3, 1888-9. ,,

Royal Geographical Society. Proceedings, New Monthly Series, Vol. X., Nos. 11 and 12, 1888; Vol. XI., Nos. 1 and 2, 1889. ,,

Royal Meteorological Society. Quarterly Journal, Vol. XIV., Nos. 67 and 68, 1888. The Meteorological Record, Vol. VII., No. 28, 1887; Vol. VIII., Nos. 29 and 30, 1888. ,,

Royal Microscopical Society. Journal, Parts v., vi,, and vi.a, 1888, Part i., 1889. ,,

Royal United Service Institution. Journal, Vol. XXXII., Nos. 145 and 146, 1888-9. *The Institution.*

Zoological Society of London. Proceedings of the Scientific Meetings, Part iii., 1888. *The Society.*

LUBECK—Naturhistorisches Museum. Jahresbericht, für das Jahr, 1887. *The Museum.*

MARBURG—Gesellschaft zur Beförderung der gesammten Naturwissenschaften. Schriften, Band XII., Abhandlung 2, 1887. Sitzungsberichte, Jahrgang 1886 and 1887. *The Society.*

Königlich Preussische Universität. Eighty-nine (89) Inaugural Dissertations. *The University.*

MELBOURNE—Field Naturalists' Club of Victoria. *The Victorian Naturalist*, Vol. V., Nos. 8—12, 1888-9. *The Club.*

Government Botanist. Key to the System of Victorian Plants, Parts i. and ii., 1885-88. Select Extra-Tropical Plants, readily eligible for Industrial Culture or Naturalisation, Seventh edition, 1888. Systematic Census of Australian Plants, with Chronologic, Literary and Geographic Annotations, Fourth Supplement for 1886, 1887 and 1888, by Baron von Mueller, K.C.M.G., F.R.S. *The Government Botanist.*

Government Statist. Victorian Year-Book for 1887-8, Vols. II. and III. Vital Statistics of Melbourne and Suburbs (Greater Melbourne)—Report for the year 1888. *The Government Statist.*

Mining Department. Mineral Statistics of Victoria for the year 1887. The Gold-Fields of Victoria.—Reports of the Mining Registrars for the quarters ending 30 Sept. and 31 Decr., 1888. *The Secretary for Mines, &c.*

MELBOURNE—National Museum. Prodromus of the Zoology of Victoria, Decade XVII., by Frederick McCoy, C.M.G., M.A., F.R.S. *The Director.*

Royal Society of Victoria. Transactions, Vol. I., Part i., 1888. *The Society.*

METZ—Vereins für Erdkunde zu Metz. Jahresbericht, Band X., 1887-88. ,,

MEXICO—Observatorio Astronómico Nacional de Tacubaya. Anuario, Año IX., 1889 *The Observatory.*

Observatorio Meteorológico-Magnético Central de Mexico. Boletin Mensual, Tomo I., Núm 8, 9, 10, 1888. *The Observatory.*

Sociedad Cientifica "Antonio Alzate." Memorias, Tomo II., Cuaderno Núm 3, 4, 5, 1888. *The Society.*

MONTREAL—Natural History Society of Montreal. *The Canadian Record of Science*, Vol. III., Nos. 4 and 5, 1888-9. ,,

Royal Society of Canada. Proceedings and Transactions. Vols. III., IV., V., 1885, 1886, and 1887. ,,

MOSCOW—Société Impériale des Naturalistes. Bulletin, Tome LXIV., No. 3, 1888, and Supplement. ,,

MULHOUSE—Société Industrielle de Mulhouse. Bulletin, Sept., Oct., Nov., 1888. ,,

MUNCHEN—Königlich Bayerische Akademie der Wissenschaften. Abhandlungen der Mathematisch-physikalischen classe, Band XVI., Abtheilung 2, 1887. Sitzungsberichte, Heft 1, 2, 3, 1887; Heft 1, 2, 1888. Ueber die Molekularbeschaffenheit der Krystalle, von Dr. Paul Groth. *The Academy.*

NAPLES—Società Africana d'Italia. Bollettino, Anno VII., Fasc 9—12, 1888. *The Society.*

Società Reale di Napoli. Rendiconto dell'Accademia delle Scienze Fisiche e Matematiche, Serie 2*a*, Vol. II., (Anno XXVII.) Fasc 1—12, 1888. ,,

NEWCASTLE-UPON-TYNE—North of England Institute of Mining and Mechanical Engineers. Transactions, Vol. XXXVII., Parts v. and vi., 1888. *The Institute.*

NEW YORK—American Chemical Society. Journal, Vol. X., Nos. 4, 5 and 7, 1888. *The Society.*

American Geographical Society. Bulletin, Vol. XX., No. 4, and Supplement, 1888. ,,

Science, Vol. XII., Nos. 298—308, Oct. 19—Dec. 28, 1888. *The Editor.*

The Journal of Comparative Medicine and Surgery. Vol. X., No. 1, 1889. ,,

New York Academy of Sciences. Annals, Vol. IV., Nos. 3 and 4, 1888. Transactions, Vol. VI., 1886-1887, Vol. VII., Nos. 1 and 2, 1887. *The Academy.*

New York Microscopical Society. Journal, Vol. IV., Nos. 3 and 4, 1888, Vol. V., No. 1, 1889. *The Society.*

School of Mines, Columbia College. *The School of Mines Quarterly*, Vol. X., Nos. 1 and 2, 1888-9. *The School of Mines.*

OTTAWA—Geological and Natural History Survey of Canada. Catalogue of Canadian Plants, Part iv.—Endogens, by John Macoun, M.A., F.L.S. *The Director.*

OXFORD—Bodleian Library. The Bodleian Library in 1882-7. Report from the Librarian. *The Trustees.*

PARIS—Académie des Sciences de l'Institut de France. Comptes Rendus, Tome CVII, Nos. 17—27, 1888. *The Institute.*

Société d'Anthropologie de Paris. Bulletins, (3 Série) Tome XI., Fasc 3, 1888. *The Society.*

Société de Biologie. Comptes Rendus, 8 Série, Tome IV., Nos. 13 and 14, 1887, Tome V., Nos. 31—41, 1888; 9 Série, Tome I., Nos. 1—9, 1889. ,,

Société de Géographie. Bulletin, 7 Série, Tome IX., Trimestre 3 and 4, 1888. Compte Rendu Nos. 14—17, 1888, Nos. 1—3, 1889. ,,

Société Entomologique de France. Bulletin, Nos. 7—11, 13—18, 20—24, 1888. ,,

Société Française de Minéralogie. Bulletin, Tome XI., Nos. 7 and 8, 1888; Tome XII., No. 1, 1889. ,,

Société Française de Physique. Réunion, Nov. 16, Dec. 7 and 21, 1888; Jan. 4, 18, Feb. 1, 15, Mars 1, 15, 1889. Séances, Mars—Mai, 1888. ,,

Société Géologique de France. Bulletin, 3 Série, Tome XVI., Nos. 6 and 7, 1888. ,,

Société Zoologique de France. Bulletin, Tome XIII., No. 8, 1888. Tome XIV., No. 1, 1889. ,,

PHILADELPHIA—Academy of Natural Science. Proceedings, Part iii., 1887, Part i., 1888. *The Academy*

American Entomological Society. Transactions, Vol. XIV., Nos. 1—4, and Supplementary Volume, 1887. Vol. XV., No. 1, 1888. *The Society.*

American Philosophical Society. Proceedings, Vol. XXV., No. 127, 1888. ,,

Franklin Institute. Journal, Vol. CXXVI., Nos. 755, 756, 1888; Vol. CXXVII., Nos. 757, 758, 1889. Report of the Banquet to Commemorate the Framing and Signing of the Constitution of the United States. *The Institute.*

Second Geological Survey of Pennsylvania. Annual Report for 1886, Part iii., and atlas. Atlas, Western Middle Anthracite Field, Part ii. *AA*. Atlas, Bucks and Montgomery Counties, *C*. 7. *The Board of Commissioners.*

PISA—Società Toscana di Scienze Naturali. Atti. Processi Verbali, Vol. VI., pp. 141—188. *The Society.*

PRAGUE—Königlich Böhmische Gesellschaft der Wissenschaften. Abhandlungen der mathematisch-naturwissenschaftlichen Classe Folge VII., Band i., 1885-1886. Abhandlungen der Classe für Philosophie, Geschichte und Philologie, Folge VII., Band i., 1885-1886. Bericht über die Mathematischen und Naturwissenschaftlichen Publikationen von Dr. F. J. Studnicka, Heft ii., 1885. Geschichte, der K. Böhm, Gesellschaft der Wissenschaften von Joseph

PRAGUE—*(cont.)*
Kalousek, Heft ii., 1885. Jahresbericht, 1885, 1886, 1887. Sitzungsberichte, math.-nat. Classe, 1885, 1886, 1887; philos-histor-philolog, Classe, 1885, 1886, 1887. Zrání Oplození a Ryhování Vajícka, sepsal Fr. Vejdovsky, 1888. *The Society.*

RIO DE JANEIRO—Observatoire Impérial de Rio de Janeiro. Annales, Tome III., Observation de Passage de Vénus en 1882. Revista de Observatorio, Anno III., Numero 10, 1888. *The Observatory.*

ROME—Accademia Pontificia de 'Nuovi Lincei. Anno XLII., Sessione 1*a* and 2*a*, 1888-1889. *The Academy.*

Biblioteca e Archivio Tecnico. Giornale del Genio Civile, Anno, XXVI., Fasc. 7—12, 1888.
The Minister of Public Instruction, Rome.

Biblioteca Nazionale Centrale Vittorio Emanuele di Roma. Bollettino delle Opere Moderne Straniere acquistate dalle Biblioteche Pubbliche Governative del Regno d'Italia, Vol. III., Nos. 1—6, 1888. ,,

R. Comitato Geologico Italiano. Bollettino, 2*a* Serie, Vol. IX., Nos. 7—12, 1888. *The Committee.*

Società Geografica Italiana. Bollettino, Serie iii., Vol. I., Fasc. 10—12, 1888, Vol. II., Fasc. 1, 2, 1889. *The Society.*

ST. ETIENNE—Société de l'Industrie Minérale. Bulletin, 3 Série, Tome II., Liv. 2 and 3, 1888, with atlas. Comptes-Rendus Mensuels des Réunions, Oct.—Dec. 1888, Jan. 1889. ,,

ST. PETERSBURG—Académie Impériale des Sciences de St. Pétersbourg. Bulletin, Tome XXXII., Nos. 1 and 2, 1887-8. *The Academy.*

SALEM.—American Association for the Advancement of Science. Proceedings, Vol. XXXVI., 1887, New York Meeting. *The Association.*

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A Powell & Lealand's One-twelfth Micro-objective, N. A. 1·5, and bottle of homogeneous fluid. *H. G. A. Wright.*

NOTE ON THE COMPOSITION OF TWO SUGAR PLANTATION SOILS.

By W. A. Dixon, F.I.C., F.C.S., Lecturer on Chemistry, Sydney Technical College.

[*Read before the Royal Society of N.S.W., June 5, 1889.*]

The two soils forming the subject of this notice were from a sugar plantation on the Burnett River in Queensland. They were exactly alike in appearance and were described to me as forest soil and scrub soil, from the different vegetation growing on them, and this was the only recognisable difference to the planter. In each, the soil was from fifteen to thirty feet deep, the surface indications other than the natural vegetation, were similar, and of course the climate was the same. The soils were found to differ however, extremely in their behaviour under cane crops, as, whilst the scrub soil bore cane well and yielded good crops, the forest soil grew plant canes well, first ratoons poor and afterwards of no value.

The reason of this is plainly shown in the analysis ; but before entering on this, it may be well to make a few remarks on soil analyses as it is a branch of chemical work which has of late years been somewhat discounted as of little value. It may certainly be

said with truth that the greater number by far of the analyses of soils which have been published are of little value, but the reason of this is not difficult to find, and these are that, 1st, sufficient care has seldom been taken to obtain uniform samples of the soil for analyses, and 2nd, that the analyses have not been conducted with sufficient refinement to secure the object in view. The former condition can be easily attained, but the latter can only be secured by years of practice, which is often wanting in those to whom the work is relegated.

In selecting a sample, it is commonly the practice to dig up some soil in one place and mix up ten or twelve pounds of it for a sample. If we consider that the excrement of a bird containing ten grains of nitrogen mixed with a sample so taken would be equal to 0·014 % of nitrogen or 1568 lbs per acre, and that the urine of an animal spent a year before might similarly increase, not only the nitrogen but the phosphates and other ash constituents of plants gathered from far and wide, it is evident that such a mode of sampling is liable to error and stands condemned.

The samples of soil here referred to were taken by my direction as follows :—A piece of sheet iron was bent into a tube, one and a-half inches in diameter, leaving a slit quarter of an inch wide down one side, and one end of this was fastened to a convenient handle. The ground was gone over at regular intervals of about a chain apart, when the tube or scoop was screwed into the soil and this being relieved by a spade the section of soil could easily be removed by passing a knife through the slit. The different sections allowed to dry and thoroughly mixed and sifted must give a tolerably average sample of the soil of the area operated on. This may seem a tedious operation, but without this preliminary care the work of analysis is not only useless but often misleading —which is worse.

The second reason stated for soil analyses having to some extent fallen into disrepute is that the analyses are not sufficiently refined and a reference to the greater number of soil analyses published will show that they are only carried to the second place of decimals and in most, there being no description of the methods employed, there is ground for belief that in many the figures in the second place are not of much value.

To arrive at the degree of exactitude which is required in soil analyses to be of value, we should consider the quantities of concentrated manures which are found practically of value in agriculture and determine the quantity of the same constituents in the soil to within such limits at least. If we take the weight of an acre of soil at one foot deep as five thousand (5,000) tons, it will not be far from the truth as an average, and this depth may be taken as that, which being subjected to tillage, crops derive the

bulk of their nutriment. On this basis 0·001 per cent. of any ingredient would represent 112 lbs per acre. Again if we take the quantities of concentrated artificial manures which are applied as top dressing and otherwise, we find that a soil analysis requires to be carried to the third place of decimals with certainty to be comparable with practical results, for some substances at all events. For my part I think that this third place is about the limit to which analyses can be carried with any degree of certainty, and to do this it is necessary to carry out to the fourth and take the nearest number in the third, and this requires that large quantities be operated on which require much care and patience.

The following are a few examples of the quantities of various plant foods as they are used in high farming :—

1st. *Phosphoric oxide.*—Such manures as dissolved bones—superphosphate, soluble guano, and bone dust are applied with successful results at the rate of from 2½ to 3 cwt. per acre, which would be equal to about 96 lbs. of phosphoric oxide per acre.

2nd. *Nitrogen.*—Two cwt. of sulphate of ammonia containing 67 lbs. of ammonia, produce marked results on crops, and three cwt. of nitrate of soda containing about the same quantity of nitrogen produces similar results.

In both these examples the analytical results would be represented by 0·001%. At the same time it must be borne in mind that these quantities are in addition to those already present in the soil, and that they are in a readily available form, and that land which contained only such quantities would be practically barren and worthless.

In the following analyses all the determinations except the first three, which are not of much importance, and the last which is by differences but controlled by a check determination, are made on one thousand grains, whilst those mentioned are made on one hundred. The weighings were made on a balance turning with the thousandth of a grain, so that they were to the fourth place.

The constituents determined are those soluble in cold concentrated hydrochloric acid by agitation during 48 hours, and this solution may be fairly assumed to contain all the constituents of the soil at all readily available as plant food. Ordinary commercial hydrochloric acid was used containing already iron and sulphuric acid, and to it were added small quantities of bone ash dissolved in acid sulphate of magnesia and chloride of potassium. A similar quantity of this prepared acid was put through all the processes used in each determination, and the quantities present weighed, so that the numbers obtained for the soil are the differences between it and the hydrochloric acid used. This, to a great extent at all events, eliminates errors due to the solubility of precipitates in water and the reagents used.

To the main analysis 6,000 grains of soil were treated with 1 litre of hydrochloric acid to which after 48 hours 500cc of water was added, so that of the solution 250cc represented 1,000 grains of soil. The silicates insoluble in hydrochloric acid were checked by treating 60 grains of soil with 10cc of the same hydrochloric acid side by side with the main quantity. Nitrogen was determined in 100 grains by combustion with soda lime, and nitrates were sought for by treatment with a copper zinc couple and Nesslerising.

The analyses of the two soils are as follows in air dried soil :—

	Scrub Soil.	Forest Soil.
Moisture	1·120	0·980
Combined water and organic matter ...	10·110	5·470
Oxide of iron and alumina	8·440	7·900
Oxide of Manganese	Traces.	Traces.
Lime...	0·368	0·084
Magnesia	0·029	0·010
Potash	0·034	0·025
Soda	0·028	0·011
Chloride of Sodium	0·031	0·022
Phosphoric oxide	0·023	0·026
Sulphuric oxide	0·074	0·068
Silica and silicates insoluble in cold hydrochloric acid	79·743	85·404
	100·000	100·000
Nitrogen equal to ammonia	0·245	0·207
Nitrates	Traces.	None.
Ferous oxide	Considerable.	Little.

The oxide of iron was all determined as peroxide, which in the case of the first soil would make that rather high and the organic matter correspondingly lower, but this is a matter of no practical importance.

The soils were both red loams, but it is evident that the scrub is superior as it contains more organic matter, and therefore more nitrogen and is more retentive of moisture.

The principal differences between the two, however, is in the quantity of lime which has been found to be essential to cane growth partly as a plant food, partly for keeping the soil sweet. In the scrub soil there would be eighteen tons eight cwt., and in the forest soil only four tons four cwt. per acre of soil a foot deep, and as cane roots probably penetrate further this difference would be exagerated.

THE ABORIGINES OF AUSTRALIA.

By W. T. Wyndham, Boyne Island, Queensland.

[*Read before the Royal Society, N.S.W., June 5, 1889.*]

The Ucumble Tribe inhabiting the Western Fall of New England, from the Peel to the Sovereign River, take their name from (Ucum) which means No. A small tribe which joined them on the north were called (Quieumble) from the word (Quie) which means No. To the north-west they were bounded by a tribe (Bigumble) which said (Yagga) for No. To the south and south-west by the (Wallerri) and the (Cumilri) which respectively said (Wal) and (Cumil) for No.

The Ucumble Tribe had a tradition that they arrived in the country as animals, and their old men had a great many chants descriptive of the arrival, and of that which each one said, and saw, on its arrival. As to the family relations—Cumbo has a son Cubbe, Cubbe has a son Cumbo. Bya has a son Epi, Epi has a son Bya. This arrangement continues from generation to generation. Cumbo has a sister Boothanar. Cubbe has a sister Cupathanar. Bya has a sister Marthanar. Epi has a sister Epathanar. Bya marries Boothanar. Epi marries Cupathanar. Cumbo marries Marthanar, and Cubbe marries Epathanar. This arrangement with reversions continues from generation to generation. If any one seizes a gin contrary to this order he is (Warri) *i.e.*, out-lawed, and could be killed by any one without fear of consequences. All the Cumbos consider themselves brothers, never minding how distant the tribe, nor how remote the relationship ; so with Bya and all the others. The same with the women. These brothers can interchange wives and steal each other's gins, which is principally the cause of their fights. All the Cumbos, Epis, or Cubbies of different tribes will help their brothers if fighting over a gin. They always fought most honourably before all the tribes, and the first blood shed decided the contest. Each male has his (Gier) aboriginal meat or animal, which is his totum or animal, and which he will not eat on any consideration, as he supposes he arrived in it. The same holds good in the case of the women.

Many people maintain that the aborigines have no belief in the Supreme Being, or a future state, which I am far from agreeing with. They have a God whom they call Byamy in Ucumble ; He is the "All Powerful," the "Creator," and Supreme Ruler of everything. They will not mention His name on any account,

He is too Majestic to mention. It was with the greatest difficulty I got them to impart His name to me a long time ago. The Rev. Mr. Ridley, when missionary to the aboriginals many years ago, coincided with me in this, and he was one of the few men that I have met who was well up in these facts. I may mention an anecdote of him as it is rather amusing.

The year the gold was discovered in Bingera (I being one of the chief prospectors) the aborigines camping with me on Bingera Creek told me that a (Marque) white man was coming, and on looking up I saw the Rev. gentleman, and asked him to come and partake of our repast, which was roast wallaroo; he alighted and joined us most heartily, at the same time talked most volubly to the aborigines composing my escort, when suddenly he broke out in a very wild chant of what he told me was a corrobboree he had himself composed; he showed me a copy of it in his note book and it had been evidently made up in the same way I had composed latin verse when a boy at school. This corrobboree had no meaning when translated, so that the blacks, who always appreciate the ridiculous, went into screams of laughter, and for years after used to mimic him to me.

Byamy (God) resides in the milky way which is His road. The dark patches consist of oak trees and the lighter portions of water. The natives had a very fine chant relating to this—which I have unfortunately forgotten, it began "Dibro Billar." All the chants of the creation were most religiously sung and repeated at the Booras. Their ideas of a future state are rather vague; but that they die for ever they do not believe—neither on the Macintyre nor up here in the North, as I well know. I noticed an old man, who was perfectly wild, frequently go to a high cliff in the evening and look intently out over the Pacific, so I requested a black fellow who was with me and who could interpret, to come up with me and ask him what he was looking so intently for. I knew the old fellow was a great Medicine-man, therefore I naturally felt curious, and was informed that he was looking out for his people—the departed—which he assured me were at some future time sure to reappear, and he professed to hold communion with their spirits. I will now describe what I know of a Boora, I think about the last one held on the Western Fall of New England. The natives strenuously resisted my seeing their most important ceremonies and made me promise neither to disclose the locality, nor what I saw, but as all the old men are dead I now consider myself at liberty to speak on the subject.

In the first place there were four tribes present. The (Enuin) who said (Enu) for No, Ucumble, Quieumble, and Bigumble. They made their camps at four different equidistant points, each one towards their own (Thary) *i.e.*, their own country. After the

old men had had a long palaver, they began, and cleared a large circle of two or three acres in extent, though I forget the number of inner circles, a space in the centre was left for a fire, where the young men, I believe, went through their principal ordeal. I know they were much roasted, and believe they had to bear it without a murmur, although I was not allowed to witness this, and many other ceremonies. I have since seen a similar circle in Queensland, where no doubt a Boora had been held; I pointed it out to two of my companions for I could not help being struck with the appearance, remembering my former experiences. In this instance all the circles were marked with stones, and both reminded me of Stonehenge and of Averbury in Wiltshire. On the first occasion, when I was present, the circles were very neatly marked with tied-up sheaves of grass, rock, and pieces of wood. The young men before undergoing their ordeal had to go away for two or three days and fast, in a naked condition without an opossum rug. The principal man who presided over the ceremony personated the Devil, they called him (Kar, Karman), and he made a most terrific noise with a piece of bark having a string through it, cut something like a boomerang; I fancy the noise was caused by its revolving through the air. The old men were all painted most fantastically, with pipe clay and ochre, and all put on (Goora) glory. In explanation there are many different ways of using this expression. When a tree is in blossom that tree has put on (Goora) glory. Goora (Noocoorbeen) the glory, or blossom of the apple tree. Goora (Moo-boo-beer ber-been) the glory of a largish species of ironbark and the blossom of all the other trees is mentioned in the same way. When a man goes to fight he puts on goora, *i.e.*, glory on his head, the down of the (Mullion) eagle-hawk. Whenever he puts down on his head he is said to put on goora.

The doctors and medicine men acted as priests at the Boora. These men by rain-making and conjuring in general, had a tremendous hold on the credulity of the tribe with which they resided, because the aborigines are implicit believers in witchcraft. They claimed to be able to kill any person at a distance by inserting a stone in them, which they professed to throw in some mysterious manner Indeed I have seen individuals believing themselves to be enchanted, pine away and die without any other visible cause. Several of these men were consummate ventriloquists; I recollect one in particular, called Copepbiter, *i.e.*, the man inhabited by an opossum. I have frequently been sitting down with this old man amongst the whole of his tribe, and an opossum would immediately begin to hold forth in a tree behind his back, where there were no opossums whatever, and he would at once begin to converse with this familiar spirit. The aborigines implicitly believed

in him. The medicine men carried about a medicine bag which contained pieces of crystallized quartz, and they valued those most which showed internal red spots. These were what they professed to inject into an enemy. When a man supposed himself bewitched, he would employ some other medicine man to extract the stone from him, .and after chanting an incantation he would throw the patient flat and energetically suck him and produce stone and other foreign substances from his own mouth, which he said had come out of the patient. I myself have been a patient and had this operation performed, when pins and needles were sucked out of me. Whenever an aboriginal saw a meteor he would say it was a medicine man throwing a stone from one tribe into another. In fact there was no end to their belief in sorcery. These doctors were far from contemptible surgeons in setting bones and in bleeding, they always bled from the inflamed spot, using a sharp stone, and then sucking the wound.

I will describe to you what an individual black of importance in the Ucumble tribe went through from his sickness till his death. I was camped with him at the time and saw everything. He evidently died from consumption; the tribe carried him about from place to place with the greatest tenderness. I wandered along with them through the grass-tree ranges for some length of time in the spring of the year, living almost entirely on (Girroo) the honey from the blossom of the grass-tree, which is collected in this wise: you carry a hand full of (Yappre) – the bark of the Currajong tree chewed and hammered out so that it was all fibre or like marraar the fibre of a species of grass treated in the same way. You place your hand filled with either of these substances, and run it from the bottom to the top of the blossom and so sponge the honey up. Every night there was great crying over the sick man, and great shampooing, sucking and other performances, but still he got worse and worse, till one night they took his two sons, fine healthy young men and bled them into a cooliman of bark, and made the old man drink it all up; but this had not the desired effect since he got worse nevertheless, and one morning died. His two gins at once cut their heads with tomahawks after the approved style: many others rubbed burning fire brands over their bodies, and there was great crying. Before burial the man was put in a sitting posture with the legs crossed like a tailor, the arms bound down to the thighs, the hands resting on the knees, so that in fact he is sitting nearly in his usual fashion. The grave in this instance was made in sandy soil at a distance of three miles from the camp, in a place where the aborigines had frequently been buried before as could be seen by carved trees; a circular hole was dug, and the sand thrown back about the size of a gunya. A fire was lighted in the bottom, and after it had

burned a little while it was extinguished and the ashes cleared away, a new opossum rug was carefully put round the corpse, then bark built over the body, the cracks covered carefully with grass and the earth heaped over ; afterwards logs were carefully cut about the same length and piled up in a circle over the grave to keep native dogs and other vermin from intruding, and finally a circular path was swept and cleared round the grave. Two trees were carved in diamond pattern round and round the tree, the bark having been previously stripped. After the burial we returned to the camp which was immediately shifted, and all packed up and cleared away to another part of the (Thary) country or hunting ground. I never saw so much trouble taken with the burial of gins, except on one occasion when an old gin of some importance in the tribe died ; in general they were simply thrown into a hole or stuck into a log. I have seen this mode of burial practiced by the Ucumble and Quieumble tribes, and I think the Wallerri method is very similar. Should any of the readers of this paper be anxious to see the carved trees where the aborigines are buried they can do so in the cemetery at the back of Geddise's public-house, Warrialda, where blacks and whites lie side by side ; some twenty or thirty years ago there used to be a number of these carved trees. I often sat beneath the shade of a cypress pine at this place and moralized on the supplanter and supplanted lying side by side. In the Port Curtis district and along the coast as far as Mackay, from what I have seen, the natives do not take nearly as much trouble, but simply throw the bodies into a hole and cover it with sticks, and after the flesh is decayed, they take up the bones scrape them clean, and carry them about wherever they go, but I am not so well acquainted with the customs of the Queensland blacks.

In using their stone tools, which they do very dexterously, the natives turn out work that you would hardly believe possible with such rough implements, they show great ingenuity, particularly in making their harpoon heads for spearing dugong and fish ; instead of shaving the wood up and down with the grain as a European workman would do, they turn the piece of wood for a spear-head round and round, and chip it off across the grain, working it as wooden boxes are turned on a lathe. I have often sat and watched them doing this.

There is one kind of bark canoe they make in Central Queensland that I have assisted in making, and do not recollect having seen in New South Wales. The builder cuts three sheets of bark into an oval form, he inserts one sheet in a hollow in the ground, with the ends resting one on each side of the hole, he then puts a log or some other weight in the centre of the bark so as to cause the two ends to turn up, fire often being used to get

them into the proper shape, the ends are then pared rather thin; the peel of some fibrous root (generally from a species of ficus) is used as a thread to sew the bark together; the two pieces of bark are placed on their sides, and the bottom sewn on to them by using an awl, a roll of the paper tea tree plant is used to caulk the cracks, two saplings are sewn inside to stiffen the outer rim of the canoe all round, and the okka is finished.

Their corrobborees travel a long distance from tribe to tribe. I will describe one witnessed at two places, two or three hundred miles apart, and the inference drawn from it. I had taken a mob of cattle to the Condamine or Barwon River, a long distance from Ucumble country, and while there saw an immense corrobboree. There was an image made of earth and logs, and I asked some of the natives in English (not understanding the dialect) what it was intended to represent, and was told that it was the big fellow that lived in the water. I took no further notice of it, but more than a year afterwards, being on the Bundarra River, I saw, heard, and danced at the same corrobboree, being with my own tribe the Ucumble, and found that it had just travelled there, having been brought by the Wallerai tribe. On questioning the Ucumble tribe as to what the image was intended to represent, they told me it was the Cubilgun, which in Ucumble is the name for the bunyip, warway, or polgun, which all have heard about. Some little while after this I was sitting down with some of my tribe by a large water-hole, which the blacks would not go into, as they said it was inhabited by this mythical animal, and conversing with some of the old men on the subject, they told me that the Cubilgun made a nest of leaves, reeds, and other things, but that none of them had seen it themselves, it also laid eggs; I thought no more of it, believing it all a myth. Years afterwards, having shifted my camp to the Fitzroy (where I have been fishing and hunting for the last thirteen years), I was one day wandering with an aboriginal in one of the mangrove islands, when he pointed out to me a crocodile's nest; I leave you gentlemen to draw your own inference. The aborigines barter the (yallum) bits of the nautilus shell and other things. Yallum is found with every tribe all through the interior. On the Macintyre they knew of the Bunya Bunya pine, why should not the fame of the crocodile have travelled down south as well as other things.

The aborigines in Central Queensland have many of the same customs as the tribes in New South Wales; for instance, when Keppel Island was taken up and stocked with sheep, I was the first white man that ever resided there, and on catching about half-a-dozen of the islanders—the white people that came over with me could not make them understand—I seated myself cross-legged and smoothing the ground each side of me with my

hands, they at once came and sat down alongside; this used to be the way of making welcome with the Ucumble and Quieumble tribes. At first they threw away the bread that was given them, but on my saying (Nulle thul) you and me eat, and eating some myself, they at once fell to. I have found both on the mainland and this island that the expressions are very similar to those used on the Macintyre and Big Rivers, which I perfectly understand, save that in Ucumble (Ut tee thul) answers for (Nulle thul); ut tee is derived from (Utta *inda*) you and me. Thus (Utta) me, and (Inda) you, is used in nearly every tribe, so with many other words. Evidently the different languages have been derived from one original. The aborigines having broken up, and formed small tribes from the original stock, have altered their customs more or less, to suit the requirements of the districts where they have located themselves, and their language has undergone similar changes.

[The following remarks are extracted from Mr. Wyndham's letter of 10th April, 1889.]

N.B.—I have just been speaking to one of my children who has been in India, and she informs me that Tamil for Father is Uppa, and Mother Amma: in Ucumble Uppa and Meena.

I had some communication with the Smithsonian Society of America on this subject, by whom an effort was evidently being made to trace our aboriginals from the Tamils. I do not know whether my spelling of the aboriginal words is correct or not, but the pronunciation is followed as closely as possible.—W.T.W.

NOTE ON THE RECENT RAIN STORM.

By H. C. Russell, B.A., F.R.S.

[*Read before the Royal Society of N.S.W., June 5, 1889.*]

It is not my purpose to give you a full account of the recent rain storm, but in studying it one feature has been thrown into such remarkable prominence that I have been induced to bring you a map shewing the distribution of the rain in the storm. We in Sydney in the centre of the torrent, which might almost be called a water spout, were inclined to suppose, from the few telegrams available, that our experience was similar to that of our neighbours over a wide area; but now that the returns (353)

have been received, it is at once evident that the unusually heavy rains of the Sunday and Monday were confined to a very small area, which may be indicated as being enclosed within a radius of 60 miles from Sydney. It is remarkable to see the contrast on the map. It seems indeed as if the rain outside that circle were not worth mentioning, for with the 20 inches at Sydney to 26 inches on the high land north of Parramatta, the 4 to 5 inches in the Hunter District seems hardly worth comparison. You will see, however, that the rain storm included the Sydney and Hunter Districts, and extended a little over the range in the direction of Coonabarabran, where 6 inches fell, but beyond that very little fell. However, my object now is to draw your attention to the relative rainfalls about the Metropolis, thence to Windsor and Richmond, and that which fell in the upper parts of the Hawkesbury catchment area, and in the valley of the Hunter, and I have no hesitation in saying that if on the recent occasion rain equal to that which fell about Sydney had fallen generally over these river catchments, most if not all the towns on their banks would have been swept away. I have no desire to make alarming statements, but in view of the fact before us, viz., that a rain of this intensity did actually fall within a few miles of the Hawkesbury catchment, and covering an area equal to that catchment, or that of the Hunter, it is only reasonable to look the possibility fairly in the face. We know that the approach from the N.E. of a storm centre in the midst of the storm which brought us the first part of the rain on Friday and Saturday, added this dangerous character to the rain storm by vastly increasing its intensity, and a very slight shift, one way or the other, would have brought the great downpour over one of the districts referred to. We had no warning of this part of the storm, and similar conditions may at any time come in from the eastward without warning. It is the first time in a hundred years, but what has been may be again.

Note added June 22, 1889. In connection with the above it may be worth while to recall some of the facts (now apparently forgotten) brought to light by the Royal Commission which was appointed in 1870 to make a "full and diligent inquiry" into the floods in the Hunter Valley. It will be seen that in contemplating the consequences of an increase in the flood-waters of a comparatively moderate amount, they felt called upon to point out "that it would probably leave West Maitland in ruins," and that without the bursting of any reservoir save that in the clouds. After a most careful examination of all the available facts, the commission in their report say—"During the whole of the month of March, 1870, the Hunter was bank high, and if the rainfall for the month, 17in., had been evenly distributed, the daily rate

would have been about half an inch ; but according to the returns of rainfall, it appears that from the 14th to the 18th the average daily rate was about 1 inch., and this caused the great flood which culminated at Maitland on the 20th, and which rose to 31ft. 3in. In the following month, the highest flood of recent years took place, and the water rose at Maitland, at 1 a.m. of April 26, to 34ft. 4in. : and the commission reported, 'We are inclined to think that during the height of this flood the water came down upon Maitland faster than during any flood since the settlement of the country.' At the same time, we know that a rainfall of 2in. a day for five or six days would almost double the quantity." "Such a rainfall may occur, and we feel bound to point out what would probably be the effect." "Such a rainfall might raise the water at Maitland to the level of the flood of 1820—that is 6ft. higher than the flood of April, 1870." "With such an increased elevation the quantity which breaks over the banks at Graham's would be enormously increased, and instead of passing round through the back country, would break into the town, and being joined there by the main body of the water, would sweep High-street from one end to the other, and probably leave the town in ruins." In 1870 there were but two rain-gauges in the Hunter watershed, and it is very satisfactory now to find that the calculations based on the rainfall indicated by these two gauges is substantially borne out by recent experience. Now we have 20 rain-gauges in the same district, and we find that a rainfall which averaged a little more than 1in. per day for four days, the total being 5·01, made in 1889 a flood of 33ft. 6in. ; in March, 1870, the total rain in four days was 5·08, and the flood 31ft. 3in. ; and in April the same year, with a greater rainfall, 5·98, there was a flood of 34ft. 4in. Rain, therefore, as heavy as that which fell about Sydney in the recent storm would, upon the watershed of the Hunter, produce five times as much water as they had in the recent flood. I am not prepared to say how high such a flood would rise, but it is quite certain that it would rise very much higher than any flood contemplated by the floods commission, and what they deemed possible appears in the quotations above. Observations at Sydney Observatory, since it began in 1858, show no rainfall as heavy as that of May last ; but in 1860 we had 16·81 in four days, and previous to 1858—the records at South Head show two instances of 20in. of rain within 24 hours, and in one case 21in. rain fell at Illawarra in three days. So that it is quite evident that such tropical rain storms must be considered as by no means impossible on this part of the coast. When the report of the 1870 Floods Commission appeared, many persons thought that too gloomy a picture had been made, and that practically it is impossible for the water to rise to such a level as the commission mentioned.

The opinion of the commissioners is, I think, worthy of more consideration than the statements of non-professional men, and while they contemplated the possibility of 10 or 12 inches of rain in five or six days, we are obliged from actual experience to admit that 25in. might fall in four days. The commission advised that in the event of a flood rising 2ft. above that of April, 1874, and showing no signs of immediate abatement, that "it will be time for the inhabitants to seek safety upon higher ground," but how this was to be done they did not indicate. Perhaps the story of the old blacks is not so improbable as some have supposed. They said they had seen the waters gradually rise and surround kangaroos and other animals on the highest land in West Maitland, and still rise until every animal on it was swept away and drowned.

WEDNESDAY, JUNE 5, 1889.

Prof. LIVERSIDGE, M.A., F.R.S., President, in the Chair.

Thirty members were present.

The minutes of the preceding meeting were read and confirmed.

The certificates of two candidates were read for the third time, of one for the second time, and of two for the first time.

The following gentlemen were duly elected ordinary members of the Society :—

Delohery, Cornelius, J.P., C.P.S. ; Sydney.
Stephen, Arthur Winbourne, L.S. ; Sydney.

The Chairman announced that the Society's Journal, Vol. XXII. for 1888, had been distributed to all members entitled to it.

He also announced that the Council had awarded the Society's Medal and money prize of £25 to Mr. Thomas Whitelegge, for his "List of the Marine and Fresh-water Invertebrate Fauna of Port Jackson and the neighbourhood."

The following letter was read from Major Chapman :—

57 Elm Park Gardens,
Chelsea, London S.W.
April 18th, 1889.

To the Secretary, Royal Society of New South Wales.

Sir,—Kindly excuse the liberty I take in writing to you but I have an idea relative to the preservation of water, which I wish you would lay before the Royal Society.

It has been proposed to try the effect of oiling the sea to prevent fogs. Now fogs must be in some measure, if not altogether, caused by evaporation, therefore the experiment might be worth trying of oiling wells, ponds, and what I believe in Australia are termed waterholes, namely places filled with water in the dry bed of a river during the summer months, to save the water from solar evaporation. A drop of oil will sometimes expand to a circle with a diameter of about three feet and so not much oil would be required. If any gentleman would try the experiment of oiling the wells, ponds, and tanks on his sheep run for a few weeks during the hot season, some experience would be gained, even if the water were not preserved from solar evaporation; and the expense would be slight, though I suppose the waters would have to be kept constantly oiled.

Personally I have no experience in the matter, and have never been in Australia, and only now offer what I have read; but I should be very happy to assist any gentleman making the experiment by sending out different kinds of oil or in any way I could.

My apology for troubling you with this letter, is that any one should mention what may occur to him, which might check Australian drought.

Yours truly,

W. E. CHAPMAN.

Remarks were made by the following gentlemen, Messrs. H. C. Russell, J. F. Mann, W. A. Dixon, W. M. Hamlet, and P. N. Trebeck.

A circular was read from the Société Botanique de France respecting the Botanical Congress to be held in Paris in August, 1889.

Mr. W. A. Dixon, F.C.S., read a paper on "Analyses and Observations of two Sugar Plantation Soils."

In the absence of the author, the Hon. Secretary read a paper by Mr. W. T. Wyndham on "The Aborigines of Australia."

Mr. H. C. Russell, B.A., F.R.S., read a "Note on the Recent Rain Storm."

The thanks of the Society were accorded to the various authors for their valuable papers.

Mr. Russell exhibited three new meteorites, and spoke as follows: "On May 23, I received from William Kilpatrick Esq., of Cornalla Station, two meteorites which he found on Barratta Station, 34 miles north of Deniliquin, and near the site where the large meteorite was found; one of the two is in appearance remarkably like the large one I have had for so many years, and in specific gravity they do not differ very much, the old one is 3·387 and the new one 3·706, it gross weight is 31½lbs. The second one from Barratta weighs 48lbs., and in specific gravity comes very close to the old one, it is 3·429, though somewhat like in appearance, it is lighter in colour externally, and very much so internally, and it is not so deeply fused on the surface, in fact only a

very thin skin has been melted in its passage through the atmosphere. The fourth one was given to me by John A. Yeomans Esq., of Gilgoin Station near Brewarrina, and the meteorite was found on Gilgoin Station. It weighs 67½lbs. and has evidently been a long time upon the earth, for the affect of rain and weather has made many cracks in it, owing probably to the oxidation of the iron it contains. It still has the power of attracting the magnet but not strongly. Its specific gravity is 3·857. It is quite evident that at one time it was much larger, greater part of the original skin has disappeared under the action of wind and rain, and in places large pieces have evidently fallen off. In this respect it differs much from the two from Barratta Station, which do not seem to have suffered from wind and weather and have only lost some pieces, which have been broken off with a hammer. As to the chemical composition of these meteors we at present know nothing, but I hope our President Professor Liversidge, may be induced to examine them and see what they contain ; two of them at least, are obviously what are called stony meteorites. The Gilgoin one evidently once contained much iron, and has still enough in it to attract the magnet, but a great deal has been oxidised since it fell upon the earth."

A discussion followed in which the following gentlemen took part :—Messrs. E. A. Baker, W. A. Dixon, W. M. Hamlet, Judge Docker, Mr. C. S. Wilkinson, the Chairman, and Mr. Russell.

Prof. T. P. Anderson-Stuart, M.D., exhibited and explained various forms of the "Kymoscope" devised by him to demonstrate many of the phenomena of wave motion and of hydraulics, including specially many of the physical phenomena of the circulation of the blood He also showed that a steel hoop held between finger and thumb vertically, obliquely and horizontally would successively reproduce in detail the form of a transverse section of the thorax of quadruped, human fœtus and human adults, thus demonstrating how largely the form of the chest depends on gravitation.

The thanks of the Society were accorded to the various exhibitors.

The following donations were laid upon the table and acknowledged :—

Donations Received during the Month of May, 1889.

(The Names of the Donors are in *Italics*.)

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MISCELLANEOUS.

(Names of Donors are in *Italics*.)

3 Maps (A., B. and C.) Shewing the locality of the deaths in the City for the Six Months ended March 1, 1889, prepared by the City Health Officer.
The Right Worshipful the Mayor.

ON THE HIGH TIDES OF JUNE 15—17TH.

By JOHN TEBBUTT, F.R.A.S., &c.

[*Read before the Royal Society of N.S.W., July 3, 1889.*]

IN a brief note published in the *Herald* of the 21st instant, the Government Astronomer has drawn attention to an unusually high tide which occurred at Fort Denison in Sydney Harbour in the night of June 15th, the water having risen to a point 6 feet 8 inches above the zero of the gauge. I may state that ever since the establishment of the tide gauge on the South Creek, due south of my Observatory, towards the close of March last I had looked forward with interest to my own local records of the tides immediately to follow the full moon of June 1889. In a letter to my esteemed friend, the Rev. Dr. Woolls of Burwood, dated April 11th, I expressed my anticipations respecting the probable magnitude of these tides. I had already remarked that at her opposition in June the moon would be within two hours only of her perigee, and that a very close one, her distance from the centre of the earth being only 55·99 equatorial radii of the latter body. In addition to these two conditions favourable to the production of a large tide generally, there was the local condition that the moon would reach her point of greatest south declination, 23 degrees, only thirty-one hours after the opposition. It will thus be seen that, not only would the conditions for a large tide-wave generally be forthcoming, but also that the vertex of the tide-wave itself would approach close to the parallels of Sydney and Windsor. This circumstance would give a high perpendicular section for the wave as it passed the meridians of the Observatories. These were my reasons for

looking forward with considerable interest to the records of the tides following the June full moon, but it will been seen from what follows that I was rather unfortunate in the results. My tide-register after furnishing a continuous trace of the tidal movements of the South Creek for about two months had to be removed on the 26th May last in consequence of the flood which occurred at the close of that month. Owing to the long interval required on that occasion for the subsidence of the stream the gauge could not be again placed in position till about noon on the 14th instant. In the afternoon of this date it registered its first high tide at 2h. 15m., which turned out to be unusually high. The lowest of the low tides recorded here since March 27th, when the gauge commenced its regular records, occurred at 3h. 12m. a.m. on April 9th, when the surface of the Creek was 10ft. 4½in. below the arbitrary datum or zero of the scale, but the high tide just referred to, attained to 6ft. 8½in., which exhibits a range of 3ft. 8in. This range, however, would be very much smaller than that in the Hawkesbury itself, of which the Creek is but a tributary. The difference is due to the contraction of the mouth of the smaller stream. The seven high tides following that of 2h. 15m. p.m. on June 14th unfortunately were not registered in consequence of the water rising to a point much higher than that allowed for the rise of the float. It was obvious from the incomplete traces themselves that the night tides of June 15 – 16th and 16 – 17th were much higher than the other five which could not be recorded. It is quite certain that the two tides more particularly referred to must have risen nearly two feet higher than the high-water level of June 14th 2h. 15m. The evening tide of June 18th was duly registered, but that on the morning of the 19th was too high. Since this epoch the tidal-movements have been recorded with their usual regularity. It is a most unfortunate circumstance that the gauge had not been so arranged as to admit of the registration of these extraordinary tides. I certainly did not anticipate tides of such magnitude and I am still of opinion that the causes were not wholly of an immediate astronomical character. The phenomena may be due in some measure to rain water coming down the river, to the heaping up of the water along the coast by heavy north-easterly gales and to the low atmospheric pressure which obtained at the time. They were of so unexpected a character that I was about to write to the Government Astronomer to ask him if any abnormal movements of the water had taken place in Sydney Harbour, when I observed his note in the *Herald* on the subject of the recorded high tide at Fort Denison. Mr. Russell in his letter draws attention to the circumstance that a still higher tide was recorded at 9h. 30m. p.m. on May 26th, 1880, when the water rose to a point 3½ inches higher. On refering to the

astronomical conditions at that epoch, I find that the moon was in opposition at 4h. 44m. p.m. on May 24th, that she was in a very close perigee (56·05 equatorial radii) eleven hours subsequently and that the vertex of the wave passed again very close to Sydney. It appears therefore that the astronomical conditions were then eminently favourable for extraordinarily high night tides. I may very suitably bring my remarks to a close by pointing out that immediately after the full moon of July we shall be again visited with high spring tides in the night, though the conditions are not quite so favourable for height as those which obtained at the last full moon. I may also add that after July the tides will not be remarkably high from immediate astronomical causes till the new moon of December next. The conjunction occurs at 10h. 56m. p.m., Sydney time, on December 22nd, the perigee (distance in equatorial radii = 56·03) thirteen hours later, and the moon's greatest south declination, 24°, at 5h. p.m. on the 23rd. The highest tides will occur about the 24th and 25th, but on this occasion they will be in the day-time. These expectations are of course founded on purely astronomical considerations alone. It may be that the magnitude of the tides will be modified by causes which are regarded as strictly meteorological. For instance, if heavy easterly gales and a low atmospheric pressure prevail the predicted tides will probably prove much higher even than I anticipate, but on the contrary should strong westerly winds with high pressure prevail they will prove not so high as expected.

Windsor, June 25, 1889.

WEDNESDAY, JULY 3, 1889.

Prof. LIVERSIDGE, M.A., F.R.S., President, in the Chair.

Twenty members were present.

The minutes of the last meeting were read and confirmed.

The certificate of one new candidate was read for the third time, and of two for the second time.

The following gentleman was duly elected an ordinary member of the Society :—

Mingaye, John C. H., F.C.S. ; Parramatta.

In the absence of the author Mr. F. B. Kyngdon read a paper by John Tebbutt, F.R.A.S., "On the High Tides of June 15—17th 1889."

Some remarks were made by Messrs. H. C. Russell and J. F. Mann.

The thanks of the Society were accorded to Mr. Tebbutt for his valuable paper.

Mr. Kyngdon also read a paper by Mr. Thomas Whitelegge, on "The Marine and Fresh-water Invertebrates of Port Jackson and the neighbourhood."

In conveying the thanks of the meeting to Mr. Whitelegge, the Chairman presented the Society's medal, which together with a money prize of £25 had been awarded to him for his paper.

Mr. Whitelegge duly responded.

Prof. Stuart referred to Mr. Whitelegge's remarks respecting the difficulty he had laboured under, in preparing his paper, from the want of certain necessary books upon the subject, which could not be obtained in Sydney. He stated that at his (Prof. Stuart's) instigation a general catalogue had been made of the various scientific periodicals contained in the principal libraries of Sydney; this would shortly be published and he had no doubt would prove of great service to scientific workers, by showing what books were in the city and where they could be found.

Professor Anderson Stuart showed a modification of the Kymoscope which he exhibited at the Society's last monthly meeting. This form demonstrated the phenomena of interference in wave motion—one series of tubes had one wave, a parallel series had the other and both opened into a common series in which the interference was made visible. The two waves came from pumps which could be so arranged as to vary the amplitude of the waves as also the phase in which the waves came together.

Mr. Russell congratulated Prof. Stuart upon his very successful and valuable invention of the 'Kymoscope' and the chairman tendered the thanks of the Society for the exhibit.

The meeting was adjourned till the first Wednesday in August.

The following donations were laid upon the table and acknowledged :—

DONATIONS RECEIVED DURING THE MONTH OF JUNE, 1889.

(The Names of the Donors are in *Italics.*)

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Report of the Central Park Menagerie, New York. *W. A. Conklin, Ph.D.*

Schwærer, M. Emile.—Le Milieu Interstellaire et la Physique Moderne. *Prof. Liversidge, M.A., F.R.S.*

Tate, Prof. Ralph, F.L.S., F.G.S.—Additions to the Flora of the Port Lincoln District, incluling brief Descriptions of two New Species. Plants of the Lake Eyre Basin. Census of the Fauna of the Older Tertiary of Australia. Descriptions of some New Species of Marine Mollusca from South Australia and Victoria.

A Supplement to a List of the Lamellibranch and Palliobranch Mollusca of South Australia. A Census of the Molluscan Fauna of Australia. Census of the Mollusca of Australia. The Gasteropods of the Older Tertiary of Australia (Part ii.). *The Author.*

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THE SOURCE OF THE UNDERGROUND WATER IN THE WESTERN DISTRICTS.

By H. C. Russell, B.A., F.R.S.

[*Read before the Royal Society of N.S.W., August 7, 1889.*]

In a dry country like the interior of Australia, it is a surprise to many persons to find such an abundant supply of underground water, and many theories have been propounded about it. The highlands of New Guinea, and even more distant countries have been mentioned as the source of the water, and when I pointed out just ten years since, the remarkable relations existing between the rainfall and rivers of the west, I was told by engineers and squatters, who knew all the country, that it was impossible that my statements could be true. It was most positively asserted that no rain ever fell there that would wet the ground 18 inches deep, much less afford any for underground supplies; with equal confidence it was asserted that what did get into the ground was all dried out again by evaporation, and further, that the greater part of the Darling River basin was so flat that water would not run upon it; and that the rain therefore did not and could not, any portion of it, find its way into the river. To these and many other statements I felt that it was of no use making counter statements until facts should be collected that would give a fair basis for argument. I had stated the results of the first measures of rain and rivers, and they were so surprising that few believed them, and I determined to wait until the results for several years should be available for discussion before speaking again, for the question at issue is of great scientific as well as practical import-

ance. I may say in passing that I do not think the question can be finally settled yet, but the interval has sufficed to bring out important facts which I think should be published.

First in reference to the opinion that no water reaches the Darling from the flat country, the following fact is sufficient to show that that view has been pressed somewhat too far, and will have to be modified so as to admit, that in heavy rains water does reach the Darling from it:—On the 21st January 1885, a remarkable rainstorm entered this colony in the N.W., not far from Milparinka, and travelled at the rate of about seven miles per hour, straight across country to the sea in an E.S.E. direction. On all the country round Wilcannia from 10 to 11 inches of rain fell in about 40 hours. The river had been very low for months before, but sufficient water from this rainstorm ran off the comparatively flat country, to make a flood in the Darling at Wilcannia that reached a maximum of 28 feet above summer level; this flood did not subside to the old level until February 26, which was clear proof that the rain water not only filled the river, but continued to drain into it for several weeks. Certainly, the water did not come down past Bourke, which, being in the margin of the storm, was but little affected by it; and the river measures there showed that the only rise reached its maximum at 4 feet and was all over in four days. There was no other possible way for it to come, but off the country about Wilcannia, where the rain storm passed over. It was obvious therefore, that the opinion referred to, although generally true, must be taken with some reservation, for the instance just given shews that the Darling is in times of heavy rain fed by the drainage off the country below Bourke, and this amounts to proof that at times it is fed by other parts of the flat country. With reference to the view that the underground water comes from New Guinea or even more distant high land, that is South America, it seems hardly necessary to answer it seriously, it is quite certain however that even if the mountains of New Guinea could drain into our western plains the area of them is utterly insufficient to afford the supply.

It is impossible to say exactly how much is lost from the ground by evaporation. We could tell approximately how much was lost from the rivers, but the investigation of the loss from soil is a very difficult matter, for reasons which might easily be explained. So long as the surface soil is wet the evaporation goes on from it rather faster than from water, but as soon as the soil dries down half-an-inch, which does not take long, the evaporation from it practically ceases, the layer of dry earth seems an effectual covering to the water below, it is obvious then that the evaporation from soil does not go on at the rate which many persons suppose it does, and I am quite convinced that

this source of loss does not seriously affect the underground supply; once the water has sunk into the porous soil it is safe. This view of the effect of evaporation is borne out by the fact that the Murray is subject to similar temperature and wind to cause evaporation and they do not there dissipate all the water as some have supposed they do in the Darling country. This is a very strong argument against the view, so often expressed, that the small quantity of water in the Darling is due to the influence of evaporation upon the rainfall.

On the other hand, in reference to my own statements, I freely admit that they have been based upon measures that might be made more accurate, if professional men could be employed to measure the discharge of the river continuously, but since that has so far been found impracticable, I have been obliged to fall back upon the careful measures of the river velocity section &c., made many years since by officers of the Harbours and Rivers Department; and the assumptions I have made are, that the section of the river at Bourke has not materially changed since then, and that in floods of the same height, the velocity now would be the same as it was then. So far as the measurements of rain are concerned, we have a sufficient number of rain-gauges over the basin of the Darling to show with some degree of accuracy what the rainfall is: and as to the section of the river at Bourke I am told that as a matter of fact it has not materially changed since the sections were surveyed, and the only recent measures of the velocity of the current near Bourke confirm the velocities determined 20 years since, that is for the same height of flood water. When I first began to compare the rainfall and the river discharge of the Darling, I was so surprised that I thought there must be some mistake in the velocity and section of the river, and I therefore used a margin for possible error, which more careful investigation since has proved to be amply sufficient. I am quite sure therefore that in all cases, I have rather over than under estimated the quantity of water which is carried off by the Darling.

For the past ten years upon the assumptions just referred to the discharge of the Darling River has been taken as a percentage of the rainfall and the yearly amount has varied from 5·81 to 0·09 per cent., the mean for the ten years being 1·46 per cent.; a startling result, and one which I believe to be without a parallel in any country in the world. It has been my custom to assume that the basin of the Darling, for this purpose, was just that part of it enclosed by the great branches which begin above Bourke and spread out towards the mountains like the branches of some mighty tree. I have done this because I admit that there is some truth in the statement that no rain-water reaches the Darling from the flat country, but as I have shewn, there are remarkable

exceptions to this rule. Over this assumed basin then, which is intersected by numerous water courses, we are fully justified in expecting that a considerable percentage of the rainfall would get into the river, an assumption which is fully borne out by observation and the sudden local floods which occur there, and if our investigations had been first turned to the Murray catchment which in outward appearance and rainfall is not unlike that of the Darling, except that it has perhaps a larger proportion of flat land, we should have expected to find something like 25 per cent of the rainfall passing Bourke, the fact that we only find $1\frac{1}{2}$ per cent. is, with the facts of the Murray basin before us, still more inexplicable.

In Europe from 20 to 50 per cent. of the rain flows away in the rivers; in England about 30 per cent., and here in a river—the Murray, with similar basin and rainfall to the Darling, 25 per cent. of the rain flows down the river. This remarkable condition affecting the discharge of the Darling River is one that calls for investigation, because if it be true as I fully believe, and the observations prove it, then we must have a supply of underground water which is practically inexhaustible for pastoral purposes, and in addition, sufficient to irrigate some of the land. The mean rainfall on the Darling River catchment for the past ten years has been 22·14 inches and of this, as we have seen only $1\frac{1}{2}$ per cent. or = 0·33 inches of rain passes Bourke in the river. If 25 per cent. of it, which is equal to 5·53 inches of rain passed away in this river as it does in the Murray there would be seventeen times as much water passing Bourke as actually does pass; but in addition to the water passing down the Murray we know that a certain amount of the Murray rainfall sinks into the ground to supply wells there, and hence 25 per cent. of the Murray rainfall does not represent all that is available from it. So much we find in the river, and some more, an unknown amount, is to be found in the soil. We should then be perfectly justified by the analogy of the two river basins, in assuming that the estimate just given of the amount of water which should pass Bourke is below the mark, not above it, and we ought therefore to have an underground water supply at least equal to sixteen times as much water as passes Bourke now, and this, or at least a great part of it should be useful for irrigation. That we do not find it in the Darling, is to my mind proof that it passes away to underground drainage. For some time past I have been trying to get friends living in the country to undertake percolation observations with a view of measuring what rain actually does sink down into the ground, but so far, I have not succeeded; and quite recently it occurred to me that Lake George could be made to give one answer to the question which would be much more valuable than ordinary per-

colation measures, because the area over which it extends is very large and is situated on the mountains where in all probability a great deal of the rainfall find its way down into porous strata.

Lake George is situated at the bottom of a depression or basin in the main range and is about twenty miles south of Goulburn ; the water is 2,200 feet above mean sea level, and the lake at its greatest known flood has an area of sixteen miles long by about five miles wide, but as the lake is shallow its area varies with the seasons. The basin, including the lake, is thirteen times the size of the lake, and its form is that of a long oval lying nearly due north and south. It is surrounded by mountains, which on the western side particularly are very steep, and in many places precipitous.

The conditions at Lake George seem to be more favourable than those of the Darling basin for the rain-water to run off, owing to the high hills all round it, and we should there expect a much larger percentage of the rain in the lake than in the river. It is true that the north and south ends of the lake basin are comparatively flat, but they still have sufficient fall to cause the water to run off freely, as proved by the creeks which exist there to carry the excess of rainfall ; but these relatively flat portions of the basin serve to give variety to the catchment and make it more like that which feeds the river. It is in fact a considerable area out of the same range of mountains which supplies the river, like in character and variety, and for other reasons admirably adapted for the purpose for which I am using it. It is quite certain that the lake has no outlet but evaporation, which makes it much easier to determine what goes in as well as what goes out, or the evaporation. Rain gauges have been established at each end of the lake, and at other places over the catchment, and at the south end a self-recording gauge of the level of the water in the lake has been at work for four and a-half years, this will show a change in level of one tenth of an inch or even less. An anemometer records the wind and thermometers the temperature of the lake and of the air ; we have therefore all necessary means for determining what goes into as well as what goes out of the lake, except that we have no direct measure of the proportion of the rainfall which sinks into the soil, we have however the means of doing this indirectly ; and the method I have adopted for this purpose is to examine the record sheets after rain and see if the lake has risen more than the rain gauge shows the fall of rain to have been ; if it has, the difference is obviously due to the inflow of water from the basin. It is a remarkable and well established fact that in all ordinary rains, and I include in this category, all up to 1 or 2 inches in the twenty-four hours, the lake only rises as much as the rain-gauge shows to have fallen, but as might be expected the percentage of

rain which does find its way from the hills to the lake increases with the intensity of the rain.

On 26th of January, 1885, a great rain storm passed over the lake, and 8 inches of rain fell in two days, there was of course a considerable rise in the lake, but when we came to measure it exactly, the net result was $11\frac{1}{2}$ inches; 8 inches of this had of course fallen into the lake direct as rain, and the remaining $3\frac{1}{2}$ inches represents what had come down the hills. Now it does not require many figures to find out what percentage of the rainfall in this case found its way from the basin into the lake, and if all the rain which fell on it had run into the lake there would have been a rise of 96 inches from drainage; $3\frac{1}{2}$ inches therefore represents 3·64 per cent. of the rainfall.

In 1887 a very wet year, the lake rose from drainage alone 15·86 inches, and the total rainfall for the year was 42·26, whence it appears that only 3·12 per cent. of the rainfall found its way from the basin into the lake.

In 1888 a very dry year, the rainfall was 23·90, and the lake rose from drainage alone 5·32 inches, which was equal to 1·85 per cent. of the rainfall, but this really is too favourable a statement of 1888, for during eleven months of the year there was not a drop of drainage, and it was only from the very violent rainstorm in December that any water reached the lake from the basin; in December 10·79 inches of rain fell, and in one rainstorm 3·88 inches fell in one day 1·92 inches in the next, and 1·22 the next, and during the heaviest part of this storm 1·59 inches of rain fell in twenty minutes. Of the December rainfall 4·11 per cent. ran off the hills into the lake. Taking the mean between the percentage 3·12 of a very wet year and 1·85 that of a very dry one, we get 2·48 as the percentage of rain which flows from the hills into Lake George. If this had to find its way through long river courses it would certainly be very much reduced, and probably not be more than we find in the Darling at Bourke.

It is in evidence given before the Royal Commission for Water Conservation that parts of the Darling River basin are exceedingly porous and allow the water to sink down freely, and the facts based upon measurements which I have brought forward to night, seem to me to add force to that evidence, for Lake George is in a part of the same range of mountains that the Darling drains, and fortunately as a check upon the Darling River measures, circumstances here make it possible to see what percentage of the rain that falls on this part of the mountains runs off. As I have stated just now, only about 3 per cent., equal to 0·29 inch of the great rain storm of January 1885 found its way into the lake; as the whole 8 inches fell in forty hours and only 0·29 say $\frac{1}{4}$ inch found its way into the lake, $7\frac{3}{4}$ inches must have been absorbed

by the soil, for it certainly did not remain on the sides of those hills as a sheet of water to be dissipated by evaporation. One has only to stand at the lake and look at its surrounding mountains to be impressed with the impossibility of water remaining there unless it sinks into the soil and rocks.

We have therefore in the measures which have been made at Lake George strong evidence of the possibility of rainfall sinking rapidly into the mountains as we know has been the case in the Darling River basin by the measures made there during the past ten years. It is not necessary that I should here refer in detail to the many well known cases in which water which should reach the Darling has been observed to sink rapidly into the soil. Unfortunately in nearly all cases the circumstances are such as to preclude measurements, and I was therefore the more anxious to bring the facts about Lake George, which are based upon measurements before the members this evening, because they shew in a more satisfactory way than can be done for the Darling that the water must sink into the soil very rapidly on a piece of country very similar to many parts of the Darling basin, and go a long way towards confirming the statements I made about the underground waters of the Darling just ten years since.

It is evident therefore from the measures made at Lake George that the rain there does sink into the soil where it falls, very much as it has been supposed to do on the Darling basin. It is also evident that in very heavy rains a considerable quantity of water from the flat country does find its way into the Darling, a fact fully proved by the instance just given and many others which could be added; that an enormous quantity of water many times what now passes down the river has to be accounted for, after making full allowance for evaporation and other causes of loss, admits I conceive, of no doubt whatever. When we go into figures to see how much it is, we get a surprising result, viz., that it is not less than ten-times and probably is sixteen times what the Darling now carries away. This result is based upon ten years' measures of rain and river, and from these it appears that the Darling carries away only $1\frac{1}{2}$ per cent. of the rainfall; while the Murray, a river existing under similar conditions of climate, wind, rain and evaporation, carries away 25 per cent. of the rainfall. The only difference I can see which seems to offer any clue to this great disparity in the percentage of rain carried off is the extremely porous character of much of the Darling basin. In parts of which it is a matter of common observation, that the rain sinks into the soil freely and yields little or none to the rivers, and there seems to be no doubt that abundance of water will be found below the surface both for pastoral and to some small extent for agricultural purposes.

ON THE APPLICATION OF PRISMATIC LENSES FOR MAKING NORMAL-SIGHT MAGNIFYING SPECTACLES.

By Percy J. Edmunds, Esq.

[*Read before the Royal Society of N.S.W., August 7, 1889.*]

Some years ago, when engaged in studying zoological types of a small size (not small enough however to require the use of an ordinary microscope), I found my eyes becoming strained and weakened by constant very close use at a distance of about six inches from the object. Being normal-sighted, and anxious to prevent any permanent injury to the eyes, I adopted at first an ordinary strong eye-glass, and then a watchmaker's lens. Owing to the loss of perspective following the use of only one eye, I next tried a strong pair of convex spectacles, which—while at first apparently successful,—soon brought about the natural result of "blurr" and strain. It was this failure that first drew my attention to the theory of vision, and that gave me the idea of calculating out a formula for prismatic lenses suitable for normal-sighted persons; and having since then made many inquiries as to whether such spectacles were in practical use, and having failed to find any such article in existence, or at least practically known, I venture to think that a few details concerning them may be of some interest and value.

General nature. It is as well to at once state, in order to avoid misconception on the part of oculists and physiologists, that such "spectacles" are not intended to correct structural defects in the eye. They are essentially an *optical instrument*, and not a medical appliance. The lenses used are lenticular prisms ground to a definite formula for producing the end in view,—namely, to move the point of observation to a greater apparent distance from the eyes, and at the same time to magnify the object.

In order to make the principle clear, it will be necessary to first of all refer to the effect of ordinary convex spectacles, when used by a normal-sighted person.

In figure 1 A B and A^1 B^1 are the two convex lenses. P is a luminous point. Q_1 is the image of P formed by A B; Q_2 is the image formed by A^1 B^1. The existence of these two images, which are neither coincident nor located at the intersection of the two axes of the eyes, forms an insuperable obstacle to distinct vision.

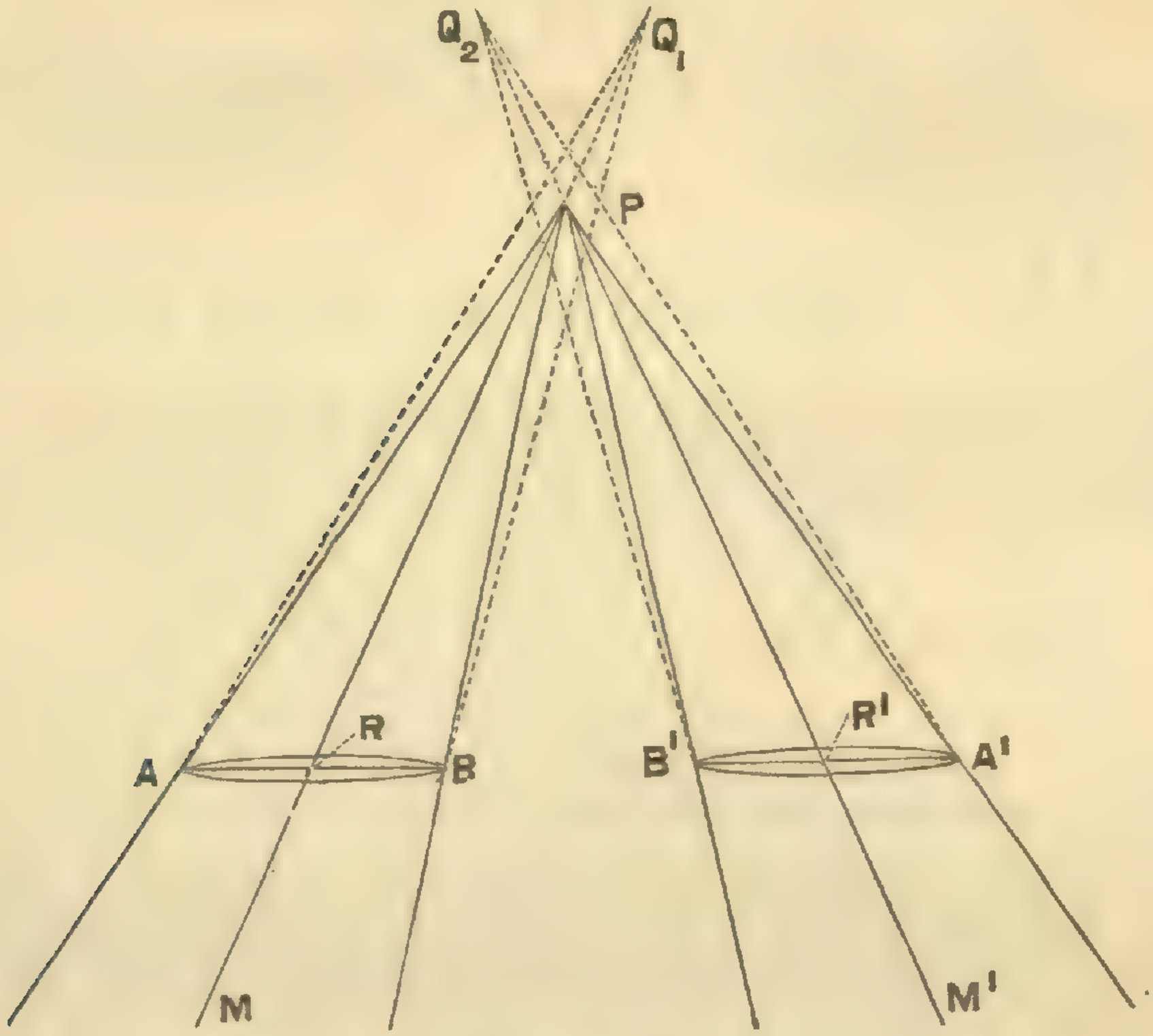

FIGURE I.

But by the use of prismatic convex lenses, these two images may, *if the lenticular and prismatic powers are properly calculated*, be fused into one image, as shown in figure 2.

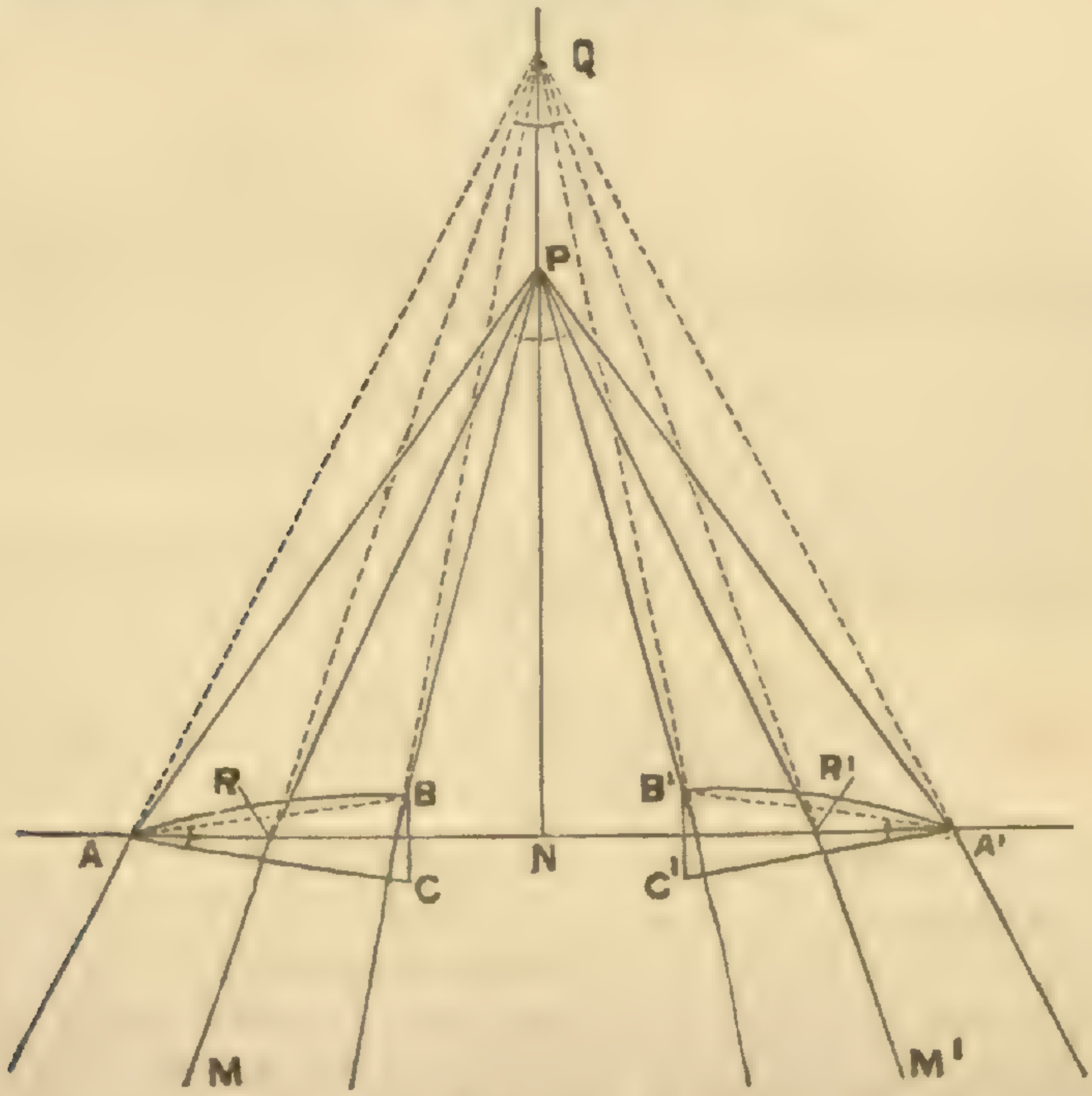

FIGURE II.

The letters here have the same meaning as before.

The calculations are effected as follows :—

Problem I.—To find the necessary focal length of the lenticular surfaces A B and A C.

Let P N = p

Q N = q

and R N = a = one-half the distance between the centres of the lenses.

Since the distance of the object P = R P = $\sqrt{(p^2 + a^2)}$

and the distance of the image Q = R Q = $\sqrt{(q^2 + a^2)}$

we get $$\frac{1}{f} = \frac{1}{\sqrt{(p^2 + a^2)}} - \frac{1}{\sqrt{(q^2 + a^2)}}$$

whence the focal distance necessary (f)

$$f = \frac{\sqrt{(p^2 + a^2)}\,\sqrt{(q^2 + a^2)}}{\sqrt{(q^2 + a^2)} - \sqrt{(p^2 + a^2)}}$$

which is the formula required.

Problem II.—To find the prismatic angle necessary. Since the actual pencil of light that enters the pupil of the eye is very small, and the ray P R M is the axis thereof, we may consider the angle P R Q as the angle of deviation.

Now angle P R Q = N R Q − N R P

$$\therefore \tan PRQ = \tan (NRQ - NRP)$$

$$= \frac{\frac{q}{a} - \frac{p}{a}}{1 + \frac{pq}{a^2}}$$

$$= \frac{a(q-p)}{a^2 + pq}$$

that is the angle P R Q = $\tan^{-1} \frac{a(q-p)}{a^2 + pq}$

and can be found from tables as required. The prismatic angle necessary, (being also small) can thus be calculated from the simple formula

angle of deviation = (u − 1) × prismatic angle (where u = index of refraction)

$$\therefore \text{prismatic angle} = \frac{\tan^{-1}\left[\frac{a(q-p)}{a^2 + pq}\right]}{u - 1}$$

The prismatic angle does not mean the angle B A C formed by the curved surfaces at A, but the angle between the *straight* lines B A and C A. That this is the *effective* prismatic angle as concerns rays near the P R is clear from elementary optical principles, since the lenticular prisms may be considered to consist of one prism *plus* one or more lenses, as shown in figure 3, where a bi-convex

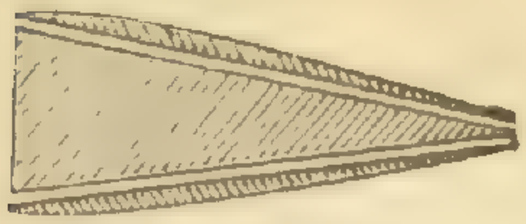

FIGURE III.

FIGURE IV.

shape is shown, or figure 4, where an equivalent meniscoid shape is given. It is also evident that the lenticular power may be arranged on either or both surfaces of the prism, provided the focal length be correct. In other words the radii may be such as to satisfy the relation

$$\frac{1}{f} = (u - 1)\left\{\frac{1}{R} + \frac{1}{R^2}\right\}.$$

Limits of the uses of such spectacles :—

The magnifying power of these spectacles is limited (unless the prisms be made achromatic) by the fact, that dispersion of light due to the prism would cause coloured borders when the prismatic angles become excessive (more than 10°). Hence it appears that the use of these spectacles is not intended to supply the place of a single lens of much shorter focus. But as shown by a list of calculations (appended) which I have already made, the uses to which they would be put require only small prismatic angles.

Though limited in their magnifying power however, they possess the important and useful property that they are suitable for any sight which could normally see *without any spectacles* at the distance NQ. NQ being generally from 10 to 20 inches, the spectacles are therefore, in general, applicable to all normal-sighted or short-sighted persons. Long-sighted persons could at the same time use such prismatic magnifying spectacles *over* the spectacles they are accustomed to for reading; or the two lenticular powers could be combined, and the focal length f calculated by the following formula :—

$$f = \frac{10 f' \sqrt{(p^2 + a^2)}}{10 f' - (f' - 10) \sqrt{(p^2 + a^2)}}$$

Where f' means the focal length of the lenses the long-sighted person is already accustomed to for reading at 10 inches distance.

Uses.—The fundamental optical principles upon which this formula of lenticular prism is constructed mark out two distinct uses to which the spectacles may be put.

(1) *For magnification*, pure and simple. This occurs in such lenticular prisms as are calculated to move the image of the image from a point *within* the range of possible vision to the normal distance of 10 inches. Such spectacles, made in different sizes to suit the distance between the pupils of the eyes, would be of use in close work such as dissecting, engraving &c.,—where slight

magnification is required without sacrificing binocular perspective. In fact for many purposes the retention of perspective is of more importance than mere magnification.

(2) *For removing the object to a greater apparent distance.* This is effected by calculating the lenticular prisms to move the object from the normal distance of 10 inches to a *greater* distance. Here, although the object is really magnified as well, the magnification is not *effective* in the same sense as in the first case, since the greater distance just compensates for the extra apparent size. There are a very large number of persons,—hard students and others,—whose eyes get weakened by too continuous application to work at what (for temporary purposes) might be considered a normal distance. Such weakness is not accompanied by any structural defect, and hence ordinary spectacles do more harm than good. The muscles of the eye simply get exhausted by continuous contraction, and no doubt the retina also becomes less sensitive. I cannot help thinking that weak spectacles of the formula above given would prove beneficial,—by simply giving *rest* to the muscles of convergence and accommodation,—for this seems all that is required. Assuming that short-sightedness is often caused by too-constant close work, it appears also that such spectacles would assist in preventing the growth of that defect.

The only objections which I have heard advanced against the use of such spectacles seem to be easily answered. In the first place, I have heard it stated that normal-sighted persons could not naturally require spectacles, and that to use them must of necessity injure the eyesight. Now this objection, although at first sight plausible, breaks down completely when carefully examined. Being essentially an optical instrument, they cannot, if constructed properly according to the formulæ given, produce any other effect upon the eyesight than would result from the use of a binocular microscope—which experience has shown does not result in ill-effect. Any argument based upon "contrariety to nature" would apply equally well to many other scientific instruments of the present day. In the present state of civilization and the division of labour, many persons have to use their eyes continuously at close work in a manner that can in no wise be called "natural;" and the constant strain upon the muscles of accommodation and convergence calls for some remedy which it seems to me that such spectacles would effectually supply.

The argument that the idea has been advanced before may perhaps have some weight; certain it is that prisms have been long known and used in conjunction with lenses for assisting in the cure of excessive long-sight and excessive short-sight. Here however the prisms have been introduced essentially to remedy or prevent the "squint" that is likely to follow the use of strong

convex or concave lenses alone. After perusing several leading medical text-books on the eye, I have found in all of them that the effect of prisms has been only treated of in connection with the cure of structural defects of the eye. In one work only is a method of calculating the necessary prismatic angle pointed out ; but owing to the approximations used and the treatment of the matter in a more or less arbitrary manner, and also owing to the fact that the matter has been treated solely from a *clinical* standpoint, there is good reason to doubt whether oculists would make any practical use of the method. In no text-book do I find that the practical uses for normal-sight referred to above have been brought forward or advocated ; much less are any tables inserted giving the results of the calculations ; nor is any practical proposal made that such spectacles should be made to standard patterns suitable for normal-sight, and for the pure purposes of magnification, or for the relief and prevention of "strain." After considering the matter now for several years, it seems to me certain that spectacles of this formula have only got to be properly constructed and tested properly before distribution to prove of great use and value.

(Appendix.)

Calculations of deviation, prismatic angle &c., for a few special cases.

Effect required.	Distance between centres of lenses.	Tangent of angle of deviation.	Angle of deviation.	Prismatic angle (u =3·2)	Focal length.
6 inches to 10 inches	2½ inch.	·0812182	4°. 39′	9°. 18′	15·64 inches
	2¼ ,,	·0734506	4°. 12′	8°. 24′	15·49
	2 ,,	·0655738	3°. 45′	7°. 30	15·416
	1¾ ,,	·0575726	3°. 18′	6°. 36′	
	1½ ,,	·0495356	2°. 50′	5°. 40′	15·23
	1¼ ,,	·0413972	2°. 22′	4°. 44′	
	1 ,,	·0331535	1°. 54′	3°. 48	
					minimum 15 inches
10 inches to 15 inches	2½ inch.	·04123711	2°. 22′	4°. 44′	30⅓ inches
	2¼ ,,		2°. 8′	4°. 16′	
	2 ,,	·0331126	1°. 54′	3°. 48′	30·2416
	1¾ ,,		1°. 40′	3°. 20′	
	1½ ,,	·0249066	1°. 25½′	2°. 51′	
	1¼ ,,		1°. 11′	2°. 22′	
	1 ,,	·0166389	0. 57′	1°. 54	
					minimum 30 inches
12 inches to 16 inches	2½ inch.	·0258314	1° 29′	2°. 58′	48·60
	2¼ ,,		1°. 20′	2°. 40′	
	2 ,,	·0207254	1°. 11′	2°. 22′	48·38
	1¾ ,,		1°. 2′	2°. 4′	
	1½ ,,	·0156767	53½′	1°. 47′	
	1¼ ,,		44′	1°. 28′	
	1 ,,	·0104031	36′	1°. 12′	
					minimum 48 inches
15 inches to 20 inches	2½ inch.	·0207254	1°. 11′	2°. 22′	60·48
	2¼ ,,		1°. 4′	2°. 8′	
	2 ,,	·0166113	57′	1°. 54′	60·43
	1¾ ,,		50′	1°. 40′	
	1½ ,,	·0124766	43′	1°. 26′	
	1¼ ,,		36′	1°. 12′	
					minimum 60 inches

FLYING-MACHINE MEMORANDA.

By Lawrence Hargrave.

[With Eight Diagrams.]

[*Read before the Royal Society, N.S.W., August 7, 1889.*]

Since December 1887, several developments have taken place in the evolution of flying-machines which it is proposed to describe more or less lucidly in this paper; perhaps the writer over-estimates their value, but it is hoped that such as they are they will shew some of our members that in effect the drudgery is done and competition aalone is wanted to bring the matter to a practical issue. Great efforts have been made to get a reliable motor; a single cylinder vertical engine absorbed much time and labour, but want of skill in construction involved such an amount of unnecessary weight that if it is ever completed it will nearly all have to be re-made.

The centering difficulty gave birth to several curious mechanisms for pulling the crank off the centre, the best of them is shewn in Fig. 1, as it may be useful to engineers where a flywheel or two cylinders are inadmissible. In the position shewn both parts of the india-rubber spring are slack, when the ball-crank pin K gets to C it begins to store power through the cord A and continues to store it until K arrives at D; this stored power is given out between D and E pulling the main crank-pin L over the top centre. When the main crank-pin L gets to F it begins to store power through the cord B, and continues to store it until L arrives at G, this power is given out between G and H, and pulls L over the bottom centre. An air compressor, reducing valve, and Richard's indicator were also made, but need no special description here.

The next engine constructed had a variety of tackle for using petroleum spirit vapour as a motive power, the only result as yet being that manual skill in silver-soldering and light engine work was acquired. At this time what may be called a most valuable invention was made, namely the mechanical movement by which the wing can be made to describe rigidly the figure-of-eight observable in the motions of the wings of living organisms; a perspective view of the model is shewn in Fig. 2; the movement is applied to the three cylinder engine Fig. 3 and will be appreciated at its true worth by the makers of trochoided plane flying-machines.

As there seemed to be considerable difficulty in making intelligible the action of what the writer calls the trochoided-plane, it was thought that by devoting some attention to the evolution of

a screw-driven machine other workers might be brought into the field. Three varieties of models were made, namely, with double and single screws in the bow, and single screw in the stern : Fig. 4 shews the single screw in the stern, and it is the most practicable and serviceable form.

It was thought that the tendency of the body to revolve on the screw shaft in a contrary direction to the screw would cause an objectionable list and swerving of the machines, and that two screws revolving in opposite directions would be necessary ; this tendency is not observed in the experiments when the screw is small in diameter compared with the width of the machine. The two-bladed screw of the model shewn in Fig. 4, is 28 inches in diameter, the blades are 9 inches long, 6 inches wide at the tips, and 3 inches wide at the inner ends, giving a total surface of 126 square inches ; the pitch is 7 feet 4 inches.

The comparison between this machine and the trochoided-plane one stands thus :—

	Screw.	Trochoided Plane.
Total area in square inches ...	2090	... 2130
Square inches area per lb weight ...	1045	... 1019
Weight in lbs.	2·00	... 2·09
lbs weight per square inch... ...	·00095	... ·00100
Foot-lbs of power used	196	... 470
Horizontal distance flown in feet...	120	... 270
Distance in feet per ft.-lb of power	·61	... ·57

This is thought to show that as propellers the screw and the trochoided plane are about equally effective, and that if either has the advantage, competition will bring it to the surface ; a feature of these machines is the trifling amount of thrust that moves a comparatively heavy body horizontally when supported by a large flat surface.

The two diagrams exhibited drawn by Fig. 5, and Fig. 4, shew a point of high thrust during the first second of time ; it is called the still air diagram to distinguish it from the following part of the card which is the moving air diagram : it is undecided which represents the moving machine's thrust, most probably the still air diagram is nearest the truth. Fig. 6, does not shew the still air diagram, because the pencil was pressed too hard on the indicator drum.

After trying unsuccessfully to find out Brotherhood's arrangement of valve gear, a three-cylinder trunk engine Fig. 3, was designed and made ; it works very smoothly and carries 120lbs of air pressure, combining lightness with accessibility, and simplicity of construction and adjustment in an eminent degree : the weight is $19\frac{1}{2}$ ounces, and the drawing shews every detail. This engine was made in about 120 hours at a cost for material of 12 shillings and is not beyond the capabilities of the most ordinary mechanic.

The idea was conceived that a three cylinder screw engine could be made by turning the boss of the propeller into an engine, thus allowing the cylinders to revolve on the crank-shaft, the shaft and crank-pin being stationary and the thrust coming direct on the valve face. Of course the idea was put into execution with all speed, resulting in the production of the predecessor of Fig. 5, which weighed $\frac{3}{4}$ of a pound, this worked so satisfactorily that after some kindred experiments were made Fig. 5 came into existence, weighing only $7\frac{1}{2}$ ounces, and taking the first five seconds of the diagram, (Fig. 6) we see that the revolutions are at the rate of 456 per minute, the receiver pressure falling from 150lbs to about 120lbs. The cylinders are ·88 inches diameter: the stroke is 1·3 inches and the valve cuts off at ·75 of the stroke. The screw blades are set at an angle of 20° giving a pitch of 44·4 inches, the diameter of the screw is $36\frac{1}{4}$ inches, and the area of each blade is 32·7 square inches.

The diagram Fig. 6 shews the thrust time and revolutions of this engine to far surpass the india rubber driven screw as a motor. The diagram was taken on one of those combination instruments which assume such varied forms in the hands of experimentalists.

The air receivers for these motors are made of ordinary tinsmith's tinned iron plate, the thickness of plate in the receiver for Fig. 5 is ·013 inches, and it is found to have a breaking strength along the plate of 62,000lbs per square inch section of metal, so 3 inches was the diameter determined on, and ·18 cubic feet capacity; the weight is 29 ounces, and it has been pressed to 250 pounds per square inch without any sign of weakness. The longitudinal seams are $\frac{1}{16}$ inch lap soft solder joints which experiment proves to be more than 100% strength; the folded joint though easier made is obviously weaker.

The whirling machine was rigged up again to see the comparative effect of cutting the body plane of flying machines transversely and putting the pieces one above another like a venetian blind, and it is found that the paper surface of the body is best in one connected piece. This instrument now has a simple method of conveying the beats of a pendulum up the revolving post to the arm carrying the indicator drum; it has also a centrifugal speed indicator.

A number of experiments regarding the positions of the centres of gravity and effort were made so that the risk of damage to a valuable machine might be minimised. A cross-bow was made for discharging various forms of stick and paper models with adjustable weights, resulting in the production of Fig. 7 as being the form necessary for the screw engine and receiver, Fig. 5. No particular virtue is attached to the sloping back of the two sides of the body plane, and it is introduced here because the receiver being

only about 4 feet long brings the centre of gravity very far aft. It is found that if more than 25% of the area is in advance of the centre of gravity the models turn up and wreck ensues as a matter of course. One remarkable experiment repeatedly made, for which the writer cannot account is that Fig. 7, which is called F model, with an area of 216 square inches and weighing 2·5 ounces is propelled 18 feet by stretching the crossbow 12 inches ; and another model called C, weighing 6·5 ounces and having an area of 756 square inches is propelled 20 feet by the same motive power, the speed of the latter being obviously slower ; it looks as if large areas were more important than powerful engines where speed was of little consequence.

As regards the slope sideways of the halves of the body plane, it is found that so long as the centre of gravity is at all below the centre of effort there is no tendency to swerve, the turning up or down of the models is entirely due to the distance of the centre of gravity from the forward edge of the body plane.

On looking into the relative positions of the centres of gravity and effort of the three most successful machines yet made, it appears that the percentage of the areas in advance of the centres of gravity are :—

48 band L.	19·3%
24 band H.J.K. ...	20·0%
48 band single screw	23·3%

These positions were arrived at by experience gained by repeated wrecks when groping in comparative darkness.

We now come to what is thought by the writer to be the most deeply interesting point in all the experiments. It is observed that the successful flyers maintain a horizontal position during a horizontal flight, that is to say, that the body plane is practically level and not tilted up forward at anything approaching the angle, theory leads us to expect.

Taking observation L., a machine of 14·8 square feet area, weighing 2·09 lbs ; *i.e.*, the paper is loaded to ·141 pounds per square foot, the speed being at the most 12 miles per hour. The sine of the angle of elevation of the machine should be equal to the pressure in pounds per square foot divided by ·0023 times the square of the velocity in miles per hour, or to support a plane of 14·8 square feet area 2·09 pounds weight by wind moving at the rate of 12 miles per hour, we should have to incline it at an angle of 25°.

This is an angle sufficiently great to be unaccountable for except by assuming that the personal equation of the observer deceived him and that what he thought was level was really tilted at an angle of 25°. Therefore it becomes necessary to invent a theory that would account for the discrepancy, and the theory is that the

visible under surface of the stationary machine is not the under surface of the flying-machine as it carries along with it and rests on a cushion of air more or less wedge shaped: and that the angle of this air cushion is self-adjusting for varying speeds within some unascertained limits so long as the machine is balanced by having from 20 to 25 per cent. of the area in advance of the centre of gravity.

Fig. 7 is to shew what is supposed to be the state of the air on and in which the machine moves. AB represents the vertical longitudinal section of the body plane. The circles and arrows are sections of transverse horizontal vortices or air rollers originated by the friction of the paper surface on the undisturbed air; these gradually work towards the tail and come to rest again after the machine has passed. There may be one or many layers of these anticyclonic vortices, but one is sufficient for this explanation, and in the figure it is greatly exaggerated, the pressure is supposed to be highest at the centres of the vortices, and their diameters to increase as they pass aft.

You will observe that the breasts of the inequalities or waves adhering more or less closely to the paper and marked C, D, E, F &c., are steepest when the vortices are small and close together, and it is thought this is the reason the first quarter of the body plane supports half the weight, and that the projections of these declivities represent an approximation to what is in effect the curved bottom of the flying machine LMB.

Again, suppose the visible under surface to be more uneven, and that the air rollers pass very slowly towards the stern, they then become, as it were, part of the structure and the lower forward parts of their circumferences Z, Y, X &c. become the bearing surface of the machine. The upper surface must be affected in a similar way, though it is thought that the vortices would have low pressure centres and large diameters producing a less curved invisible top JKB to the machine. It will be readily seen that if the speed increases the vortices have less time to increase in diameter and therefore both top and bottom curves will be flatter.

Perhaps some of the members have hauled a punt over a flat sandy beach and have noticed that when there is a little water on the sand though not sufficient to float the punt, if the bow be raised and then dropped suddenly on the water and pulled forward before the water has time to squeeze out at the sides, a long distance may be traversed with very little labour. And why? Because the punt is on water rollers. This theory may be contrary to well known laws, but if we do not state our views how can we hope to be set right by those who can interpret the facts better.

IRRIGATION IN ITS RELATION TO THE PASTORAL INDUSTRY OF NEW SOUTH WALES.

By H. G. M'Kinney, M.E., Roy. Univ. *Irel.*, M. Inst. C.E.

[With Maps.]

[*Read before the Royal Society of N.S.W., September 4, 1889.*]

Importance of the Pastoral Industry.

The great benefits which agriculture and horticulture may, under favourable circumstances, derive from irrigation are now generally admitted. But while in this colony agriculture and horticulture are of great and increasing importance, the pastoral industry is likely to maintain the leading position for many years to come. The present paramount importance of the pastoral industry is very clearly indicated by recent statistics. The total area of land in New South Wales is estimated at 196,000,000 acres, and reference to the stock returns for last year indicates that of that area 168,000,000 acres is devoted to pastoral purposes, while the extent under cultivation amounts to only 1,042,000 acres. These figures show that it is a question of great moment whether irrigation cannot be made to assist in the development of the pastoral resources of the colony.

It may be at once stated that the question has already been answered by one of the best authorities in Australia, namely, Mr. J. S. Horsfall, President of the Australian Sheep-breeders' Association and late Chairman of Directors in the great firm of Messrs. Goldsbrough, Mort, & Co. In his speech at the presentation of the last annual report of that firm in Melbourne, Mr. Horsfall stated that irrigation must play an important part in the development of the pastoral industry and in giving steadiness to it. It is the object of this paper to furnish information in support of the opinion quoted, and to give some idea of the magnitude of the question and its importance to this colony. In order to place the subject to be dealt with in a clear light, I deemed it necessary to obtain from one who had practical experience of station management a concise statement of the risks which Western pastoralists have to encounter under existing circumstances. In response to my wish in the matter, the following memorandum was very kindly supplied to me by Mr. J. W. Boultbee, who, besides having valuable experience as manager of a pastoral estate, has been gazetted as a qualified inspector of stock.

Present Risks of Pastoralists.

"In explanation of the necessity for irrigation in the purely pastoral districts, it may be observed that so far as stock-carrying

capacity is concerned these districts differ very widely, and that by far the greater area may be classified as poor. As a general rule this fact is not due to any inferiority of the soil, but to the uncertainty of the seasons and the scantiness of the rainfall. In reality, throughout a large proportion of the pastoral lands of low-carrying capacity, the fertility of the soil is remarkable. As an instance of this, it was found on the Lower Darling by actual experiment that land which in its natural state could scarcely support one sheep to every 10 acres was capable of supporting more than 20 sheep to one acre when it was laid down in lucerne and irrigated. In a dry season in such country not a vestige of grass can be seen and the leaves of the edible scrub within reach of the sheep gradually disappear. The wanderings of the starving stock in search of sustenance, and the concentration near permanent supplies of water, have the effect of pulverising the surface of the ground until the soil assumes a flour-like consistency. An almost impalpable dust is raised as the sheep move about, and is often carried in a cloud so dense and stifling as to render breathing difficult, and coating the fleeces with a layer which settles among the wool, tinging its snowy lustre and checking its growth. To such an extent does this affect the fleece that at shearing time the dust is sometimes found in a ridge an inch in thickness along the back, making the wool tender and giving it a reddish tinge which no scouring can eliminate. It often occurs, too, that in the search for sustenance in the scrub the necks of the sheep and portions of the back become covered with minute twigs, these together with the ridge of sand necessitating the dismemberment of the fleece, until perhaps the only sound portions are those along the flanks and coupling. None but those who have experienced droughts in the Western district can realise the misery they entail. The loss is enormous, not only in actual numbers of the stock, but in the failure of increase, and, as already explained, in deterioration in the quality of the wool. Efforts are frequently made to avoid or reduce those losses by sending the sheep to the mountains, or to other localities where pasture is obtainable ; but this course always involves considerable expense and much risk, and frequently results in the loss of a serious proportion of the sheep. In one instance 40,000 sheep were sent to the mountains, where the pasture just sufficed to keep them alive, and after spending the summer there they were started on the return journey. They had over 600 miles to travel, and the travelling stock routes and reserves proved to be so completely denuded of grass that hay and chaff had to be purchased at very high rates. The outlay in this way reached £600 per week ; and, notwithstanding that every possible effort was made to save the sheep, they died in thousands, and only a small fraction reached their destination. Cases of this description

are by no means uncommon, and it may be inferred from them how bad the state of the Western district must be when the pastoralists decide on encountering such risks. The sheep which remain in the West in a bad season depend almost entirely on the scrub, and in a prolonged drought large numbers of men have to be employed for the purpose of cutting down the scrub or beating down the leaves. It is difficult to imagine anything more disheartening to a stockowner than the conditions involved in such a state of affairs. Sheep are generally in poor condition when scrub-cutting is resorted to, and it may be assumed that as a rule they become weaker and less able to walk to and from water as it continues. Statistics show that in 1877 the actual loss and decrease in the number of sheep amounted to about four millions, in 1884 about six millions, and in 1888 450,000. In addition to this, the loss of increase has to be taken into account. In some cases where there was 80 per cent. of lambs marked, not 9 per cent. has been weaned, and there have been cases in which not a single lamb was saved. From this source alone the loss is enormous. In 1888 there were about nine millions of lambs, from twenty-two millions of ewes, and this on a very moderate estimate meant a loss of two millions ; that is, assuming that in an average season the return of lambs would be 50 per cent.

"In the country to which I have been referring, the change from dearth to excess of vegetation is remarkably rapid. If a good fall of rain occurs at the proper season the whole face of the country changes within a week. Within a fortnight the grass and herbage are edible, the bush revives, and the scrub shoots afresh, and within a month the pasture is luxuriant.

"It is at once evident that under such varied conditions a steadiness or uniformity in a clip from year to year is impossible. In one year the fleece is sound and clean, in another dirty and tender. Prices must vary largely, and a brand of wool so varying does not command the attention of buyers equally with a brand that is not liable to these recurring fluctuations. From these considerations it is evident that in bad seasons the loss due to deterioration of the quality of the wool must amount to a very large sum. The total production of wool in New South Wales in 1888 was 205 millions of pounds ; and if it be assumed that on an average for the whole quantity the diminution in value, owing to the nature of the season, amounted to a half-penny per pound, we find that the loss under this head alone would be over £427,000 sterling. Some of the ways in which the wool is prejudicially affected in droughts have already been mentioned, but another serious cause of diminished value is the break in the wool which is caused by a sudden change in the character of the season. The alteration in the quality of wool which takes place immediately

after the break-up of a protracted drought is at once apparent even to the unpractised eye. In regard to the losses in sheep and wool, the year 1888, though very unfavourable, was less so than many preceding years. Yet even in this case it will be seen from the figures already given that on a low estimate the direct loss in sheep and wool and in natural increase, must have exceeded £1,150,000."

In these notes Mr. Boultbee, where referring to the causes of deterioration in the value of wool and of loss in the number and natural increase of sheep, writes from personal experience, obtained when managing a large station in the district west of the Darling.

How Irrigation can Benefit Pastoralists.

From the foregoing statement of risk and losses to which pastoralists are liable, it is clear that the reduction and minimising of these risks and losses is a question of great importance. It is proposed to show that this object can in a large measure be accomplished by a properly considered system of irrigation, and not only so, but by this means the productiveness and carrying capability of an important proportion of the west of the colony can be materially increased.

At the outset the fact must be recognised that of the land in this colony suitable for irrigation only a small proportion can be irrigated, for the simple reason that the available supply of water is very limited. Our best rivers by far for irrigation purposes are the Murray and the Murrumbidgee, and the district commanded by these includes only the plains between them and a moderate area to the north and west of the Murrumbidgee. The Darling and all its tributaries, as well as the Lachlan, are so uncertain in their discharge that even by storing flood-water wherever practicable the area which can be irrigated by their waters cannot be more than a minute fraction of the western and north-western plains. In short the only portion of this colony in which irrigation can be carried on with regularity and on an extensive scale is in the part of Southern Riverina which is commanded by the waters of the Murray and the Murrumbidgee. I propose to show that not only in this part of the colony, but also throughout the whole of the country west of the Dividing Range, irrigation, carried out under favourable circumstances, will not only be remunerative to those practising it, but will add in an important degree to the national prosperity; in short, that irrigation will give steadiness to the pastoral industry, increase the carrying capability of the country in a very important degree, and greatly reduce the losses in unfavourable seasons.

Methods of Irrigation Suitable.

The methods by which the ends described can be accomplished are:—1. The irrigation of extensive areas of the native grasses.

2. The irrigation of limited areas of lucerne and other crops for fodder. The former system is in natural operation on a large scale on the Lower Murrumbidgee, as well as on a moderate scale on the lower parts of several others of our western rivers. This is precisely the same process which irrigates and fertilises the Valley of the Nile by the rising of the flood waters. In some of the cases in which it is exemplified in New South Wales, the inundations due to floods in the rivers form the chief security of the pastoralists whose lands are thus naturally irrigated. Special attention was called to this subject in my report on "Irrigation in Riverina," which was published with the Final Report of the Royal Commission on the Conservation of Water. (See abridged edition, page 82.) Nature having thus shown the method, and the results of irrigating the native grasses, it is not surprising that enterprising men were to be found to follow the example. The most striking and successful experiments of this nature are those which have been made on the Lower Lachlan and the Lower Murrumbidgee, and particularly on the pastoral estates of Mr. James Tyson. As generally happens in the case of rivers flowing through alluvial plains, the banks of the lower parts of the rivers mentioned are higher than the land adjoining. Hence, in order to divert supplies of flood-water so as to irrigate by gravitation, it is only necessary to make cuttings from the rivers with a moderate rate of fall and extend them till they run out at the level of the natural surface. Several cuttings of this kind were made on the Juanbung Run by Mr. Tyson, and one of them alone is stated to have cost £14,000. How profitable irrigation of the native grasses can be made under such favourable circumstances is very clearly shown by the figures supplied by Mr. J. L. Gwydir regarding the work of this description done on the Corrong Run. With an expenditure of very little over £1,200 Mr. Gwydir succeeded in irrigating over 17,000 acres of grass land during every flood in the Lachlan. Taking interest and cost of maintenance together at £150 per annum, the cost of irrigating an acre amounted to only three-seventeenths of a shilling or slightly over 2d. Judging from the figures given by Mr. Gwydir, it is clear that the profits of the first year's operation of the works more than covered the entire outlay. Hence it appears that if in this case the irrigation of an acre had cost 2s. instead of 2d., there would still have been a fair return on the amount expended. The remarkable change brought about will be more fully realised when it is stated that whereas before any irrigation was done the land referred to barely sufficed for 4,000 sheep, after the system of watering was adopted it supported 12,000 sheep and 200 horses, besides fattening 125 head of cattle.

Irrigation of the native grasses by pumping, at a gross cost of about 2s. 6d. per acre, has given a very satisfactory return under

favourable circumstances in the northern plains of Victoria. The pumping plant in such cases was erected primarily for the irrigation of crops, but at such times as water was not required for the crops the supply was turned on to the grass land. The result of this practice in one case inquired into was that while without artificial watering the pasture land carried one sheep to an acre in a fairly good season, with the watering the same land carried five sheep to an acre every season.

It is scarcely necessary to state that the circumstances under which flooding the land is conducted the Lower Lachlan are exceptionally favourable, but there are many other similar cases to be found in which the profit from irrigation, though, perhaps, not so remarkable, would still afford a very satisfactory return on the outlay. Such cases exist on a large scale on the Murrumbidgee, the Darling, the Macquarie, and the Gwydir, and to some extent on nearly all the other Western rivers.

From what has already been stated it may be safely concluded —First, that the benefit arising from flooding the pasture land has been practically demonstrated by nature; second, that the lesson taught by nature has been successfully acted on by the construction of channels through which the land is flooded by gravitation, and, third, that pumping water for the flooding of pasture land has been, and can be made a commercial success. The profitable irrigation of the native grasses is, therefore, not a question for debate, but an important and accomplished fact; and the only point for consideration in connection with it is the nature of the circumstances under which it is practicable.

Remarks on Rates for Water for Irrigation.

It is impossible to lay down a general rule as to the rate at which water must be supplied in order to make irrigation remunerative. In fact, different crops require different quantities of water, so that the Indian system of charging according to the nature of the crops and the acreage has much in its favour. It may be assumed that in a fairly well-populated country where a demand for water exists, irrigation will, as a general rule be confined to agriculture and horticulture. This state of affairs is best illustrated in Italy, Spain, France, and India. In the last-mentioned country the crops, for which the highest rates are charged, are sugar-cane, rice, and indigo, these being the crops which require the largest and most regular supply of water. The circumstances which favour the irrigation of grass land are (1) a limited demand for agricultural products, (2) distance from market, (3) a fertile soil, (4) small rainfall, (5) fairly uniform slope of ground, and (6) an abundant supply of water. The first five of these conditions are common to a great proportion of our Western plains, while, as

already pointed out, the last applies to the district irrigable from the Murray and the Murrumbidgee, and in a less degree to some of the other river districts. In such cases, it may be stated generally that if the land can be flooded at the proper season to a depth of 3in. at a cost of 1s. per acre a very satisfactory return will be obtained. This is equivalent to stating that the actual quantity of water distributed over the land will be 10,890 cubic feet per acre ; but, even with fairly managed works, it may be reckoned that the loss in distribution will bring the total quantity up to 12,000 cubic feet per acre. It is well known that with a good class of pumping machinery, water can be raised to a height of from 30ft. to 40ft. at a cost under a shilling for every 12,000 cubic feet, and it goes without saying that in a properly designed system of canals delivering water by gravitation, the cost of water would be much smaller still. A rate of one shilling per acre is here assumed as a maximum for the irrigation of pasture land ; but there are frequently cases in which a much higher rate could be afforded. For instance, during the spring and early summer months of last season—that is from August till December of last year—when the sheep throughout the Western Division and a large portion of the Central Division of this colony were reduced almost to the last extremity, after hundreds of thousands of them had been drafted off to the hills at great loss and expense, the pastoralists would gladly have paid a much higher rate than that mentioned for the flooding of parts of their estates.

It is a striking fact that whilst the pastoralists of the south-western part of Riverina were experiencing a serious drought during last spring, an abundant supply of water was flowing past them to waste. So great was the supply flowing past Hay that during the whole of September and October, and up to the middle of November, sufficient water could have been spared to flood 8,000 acres per day to a depth of 3 in. In fact, during the two former months the available supply was much in excess of that mentioned, and a considerable quantity was available in December.

It is not too much to say that if the system of weirs proposed in my Report on Irrigation in Riverina, already referred to, had been in operation during last year, the area of land flooded by that means alone would have exceeded half a million acres. It is to be borne in mind that this could have been done without interfering with the supply proposed to be distributed in the district between Hay and Wagga. If a line be drawn due south from Hay to the Billabong Creek, and another north-west from Hay to the Lachlan River, the district commanded by the weirs referred to would lie to the west of these lines, and would extend to a considerable distance westward from the Murrumbidgee below its junction with the Lachlan. The area commanded consists chiefly

of fertile plains, which can easily be flooded in the manner suggested. At a rate of 1s. per acre for a 3 in. flooding, the direct return in such a season as last would be £25,000. The approximate estimate of the cost of the weirs was £34,500; but if navigation as far as Hay were provided for, the cost would probably amount to £50,000. In other words, the direct return in two such seasons as last would be equal to the entire outlay, and in addition there would be a great benefit to the navigation.

Besides the irrigation which might have been done on the Lower Murrumbidgee, there was during the same months sufficient water to have supplied the proposed canals in the districts on both sides of the river between Wagga and Hay to such extent that 2,000,000 of acres of pasture land could have had a 3 in. flooding after allowing for a depth of 12 in. over 40,000 acres of crops. These are doubtless large figures, and the sceptical New South Wales pastoralist may suggest exageration, just as an eminent irrigation engineer in India was surprised at the audacity of any one who expected him to believe that a single pastoral estate in New South Wales frequently includes over a quarter of a million acres. The sceptic who is unable to realise what can or will be done in this colony in regard to irrigation should visit the canal works on the Goulburn in Victoria. He will there find under construction an irrigation canal 110 ft. wide at the bottom, and with slopes of one and a-half to one. He will also find under construction a weir which is to cost nearly £100,000, and he will be able to ascertain that a second canal is to be made on the opposite side of the Goulburn from that under construction. The canal in progress may, when running full, be reckoned on to flood 12,000 acres per day to a depth of three inches.

The system of flooding the pasture land which has been referred to is merely an extension on a large scale of the system carried out already on the Corrong and Juanbung runs. In addition to the proposed large irrigation works from the Murrumbidgee and the Murray, the same system can be followed on a large scale on the Darling, Macquarie, and Lachlan, and, in fact, on the lower parts of nearly all of our Western rivers.

Simplicity of Process of Flooding Pasture Land.

An important point in favour of the irrigation of pasture land is the simplicity of the process. Where crops are to be irrigated a considerable amount of care and skill is required in the levelling of the land and in the construction and management of the laterals or minor distributing channels. In the case of the irrigation of pasture land, if the main distributaries are aligned in a scientific manner, no laterals will be required, the flooding being conducted direct from the distributaries. As irrigation is very imperfectly

understood by the great majority of our landholders, this is a matter of much importance.

An important point to be aimed at in a general system of irrigation for pastoral purposes is to have the country so dotted over with what have been termed protected areas that at least all the more valuable of the stock can be saved in time of drought without removing them to distant pastures. Throughout the whole of the plain country between the Murrumbidgee and the Murray, and to a distance of about 30 miles north and west from the former river, not only should there be no necessity for moving stock in any season however dry, but on the contrary that district should have a surplus of grass and fodder available for stock depastured in adjacent districts, In the Western Division every bad season brings famine prices and causes serious losses in stock. There are places in which losses in stock in dry seasons may always be expected to some extent, but such losses may be greatly reduced, while famine prices for hay can be entirely put an end to.

Production of Fodder by Irrigation.

In the foregoing, I have shown that under favourable circumstances irrigation of pasture land can be carried out with satisfactory results, not only by gravitation, but also by pumping. One of the conditions necessary for the profitable irrigation of pasture land is the presence of an abundant supply of water. This and other important conditions are frequently wanting, and the result is that the irrigation of small areas of lucerne or other crop for fodder will, in many cases, be the best course to adopt towards providing for bad seasons. This also is a matter which has passed beyond the experimental stage. As already mentioned, it has been proved by actual experiment that the produce of one acre of irrigated lucerne will feed over 20 sheep. In other words, if we take the case of a Western run carrying one sheep to every five acres, it has been proved that 5,000 acres of irrigated lucerne would support the same number of sheep as 500,000 acres of the land in its natural state. The practical lesson to be drawn from this is that the irrigation of comparatively small areas in suitable places will provide the means of saving large numbers of sheep when grass is scarce and of preventing deterioration in the quality of the wool.

That the production of hay by irrigation for the use of stock in dry seasons is as profitable as it is humane is a fact well known to the more enterprising of our station managers. The quantity of hay required to keep a sheep in fair condition where water is abundant is variously estimated by different competent authorities some placing it as low as 6oz. per day, but the majority fixing it at from 10oz. to 1lb per day. On this subject there is probably

no better authority than Mr. George Mair, of Groongal, and that gentleman in a recent letter to me, stated that during the last severe drought he fed 40,000 sheep for four months on hay alone, the quantity used being equal to about one pound per sheep per day. It is only necessary to add that Mr. Mair was perfectly satisfied with the course he adopted. Such an experiment successfully carried out by one of the best authorities on practical station management in New Sonth Wales speaks for itself, and requires no comment. In the case here referred to the hay was grown on the station, and was produced by irrigating the land with water pumped from the Murrumbidgee, but Mr. Mair adds that even if it had been necessary to buy the hay he would have had no hesitation in doing so. The latter course was, in fact, adopted on a neighbouring run, where the quantity of hay produced by irrigation proved insufficient to meet requirements. There are several other pastoral estates on the Murrumbidgee on which irrigation is successfully practised, and a similar remark applies to the Murray, the Lachlan, and the Darling. Irrigation has also been tried with satisfactory results on the Namoi and the Gwydir ; in fact it may be stated generally that irrigation is a proved success on all our Western rivers of any importance. Bearing this in mind and taking into account the facts already pointed out as to the small area of cultivated land which will provide for the sheep which the land in its ordinary state will support, it is clear that we have at hand a ready means of enormously reducing the losses in dry seasons.

Utilization of the River Darling.

The driest and most unproductive part of the colony is that situated west of the Darling, and next to this the district between that river and the Lachlan. Roughly speaking, it may be stated that below Walgett the Darling occupies the position of main artery to a hundred thousand square miles of dry country. It is sufficiently near the mark for the present purposes to assume that the number of sheep which this extent of country supports in an average year is ten millions. The question of whether all the more valuable of these sheep could not be drafted to the river frontage and fed there with hay during a bad season, is a very interesting and important one. If two millions of sheep, that is ont-fifth of the whole number, were drafted on to the river frontages, the quantity of hay required to keep them in fair condition during four months, reckoning 1 cwt. per sheep, would be 100,000 tons. Taking the length of the river in this case at 1,400 miles, this quantity of hay amounts to only slightly over 71 tons in every mile. As lucerne would yield at least four crops of a ton each per acre in a season, the quantity of hay required would involve

the irrigation of only about 18 acres for every mile of river on an average. Regarding the quantity of water required to produce the result described, it is safe to assume that for each cutting of the crop the maximum quantity of water would not exceed 6 in. in depth—that is, two floodings of 3in. each. This is equal to 21,780 cubic feet of water for every ton of hay produced, so that for 71 tons the quantity of water would be 1,546,380 cubic feet. This is less than is contained in a mile in length of the river where the width is 100 ft. and the depth 3 ft. The conclusion to be derived from this is that, with a system of weirs in the Darling, the quantity of water stored in the river would be far more than would be required for the extent of irrigation here described. Hence, even in a dry season, when the flow of the river had entirely ceased, a large margin would be left after providing for the irrigation estimated.

With regard to the cost and results of feeding the sheep on hay on the river frontages, it may be safely stated that the cost of producing the hay and feeding the sheep should not exceed 4s. per sheep for the four months. These sheep would naturally be the most valuable, and it would probably be a difficult matter to replace them at the end of the drought at less than 14s. per head. Hence, the saving of two millions of sheep in this manner in a severe drought would be equivalent to averting a direct loss of a million sterling, and would mean a gain of much more than that amount to the country at large.

The quantity of hay here referred to is only a fraction of what the Darling can be made to produce, and represents the result of only one of the methods in which that river should be utilised. The most important functions which the river Darling should be made to fulfil are—(1) The provision of reserves of fodder for the Western district, as already described ; (2) the flooding of large areas of pasture ; and (3) the provision of a permanent highway for navigation. To effect the last of these objects, a series of weirs and locks is indispensable, and there is no difficulty in arranging and designing these works so as to insure the watering of large areas by gravitation during every rise of the river. The raising of the water level by means of weirs will also materially lessen the cost of pumping for the irrigation of crops. Hence, if the Darling were utilised as it can be and should be, it would first of all provide the means of tiding over bad seasons; secondly, it would greatly increase the stock-carrying capabilities of the country by flooding large areas of grass land ; and thirdly, it would afford at all times cheap carriage for goods and produce.

The circumstances of the Darling are extremely favourable, in some important points, to the construction of works for the purposes referred to. The fall in that river throughout a great

portion of its length is under three inches per mile, so that by the construction of a weir the water would be held back to the extent of more than four miles for every foot in height of the weir. A low rate of fall means a low velocity—a condition of much importance to successful navigation. With a series of weirs at suitable intervals, the river at ordinary heights would consist of a succession of reaches of almost still water, so that navigation would be conducted under highly favourable circumstances. The same weirs would also hold up the water in the river to such heights that flooding the land by gravitation could be carried out in the manner already adopted on the Lower Lachlan.

Conservation of the Waters of the Macquarie.

In the Wimmera district in Victoria, the judicious expenditure of £100,000 in the conservation of the waters of the Wimmera River, raised the value of the land in the neighbourhood of the works by a million sterling. Comparing the conditions of this colony with those in the Wimmera district, we have more than ten times the area of country equally favourable to water conservation, and under as good or better circumstances in regard to the supply of water available. The Darling has here been specially referred to, but the Macquarie, the Namoi, the Gwydir, and the Lachlan also present remarkable facilities for water conservation and irrigation. As regards the Macquarie, in particular, I pointed out in a report to the Water Commission in May, 1885, after making an inspection of that river and the country adjacent to it, that "the Macquarie affords remarkably favourable conditions for the diversion and storage of floodwater." The report added that "In the district lying between the Macquarie and the Bogan there is a complete network of creeks, all or nearly all of which are well suited for the conveyance and storage of flood supplies." The report dealt chiefly with the engineering aspect of the question, and mentioned some of the places where weirs could be advantageously constructed in the Macquarie, and referred to one place where a large quantity of flood water could be stored. It might have been added that the land, as a rule, is of the highest quality, and that it is remarkably uniform and in every way suitable for irrigation. The floods of 1887 illustrated in a striking manner the comparative ease with which the Macquarie district can be watered, and the results showed the great benefits arising from such watering. On the other hand, the drought of 1888 and the losses which it entailed showed the necessity for conserving and distributing the available supply of water. The Water Commission in its second report, dealt with this comparison between the cases of the Wimmera and the Macquarie in the following terms :—"The two main streams—the eastern and western branches—which form the river Wimmera above Longerenong,

have catchment areas of 790 and 550 square miles respectively. Comparing this total catchment with the effective catchments of the Macquarie and Namoi, we find that it is less than one-seventh of the former and considerably less than one-third of the latter. In the hilly portion of the Macquarie the mean rainfall is over 23 in., and in the corresponding portion of the basin of the Namoi it is nearly 22½ in. From the available information, it appears doubtful whether the average rainfall on the upper parts of the basin of the Wimmera exceeds that on the Macquarie or the Namoi; and it may therefore be assumed that, roughly speaking, the discharge of these rivers is in proportion to their effective catchment areas. The Wimmera scheme, as already mentioned, was designed to afford a supply to an area of 2750 square miles, and there is little doubt that expectation on this head will be realised if not exceeded. The tract of country between the Macquarie and the Bogan, which is at least as well adapted for the distribution and storage of water as the Wimmera district, is, roughly, 180 miles in length by 30 miles in width, or equal to an area of about 5400 square miles. To supply this area with water, we have a river possessing a catchment more than seven times as great as that which can successfully supply an area of 2750 square miles. In the short period during which the Wimmera works have been in operation, they have, as we have shown, increased by £1 per acre the value of the land benefited; and it may reasonably be asked why equal results should not be obtained in this colony by similar works on the Macquarie and other rivers. Supposing that the works in the Wimmera district will cost altogether £150,000—and there is no reason to suppose that that amount will be exceeded—there is every reason to conclude that works can be constructed in the Macquarie District at double that amount, which will give double the supply. Judging, then, from the result achieved in the Wimmera district, it is a fair conclusion that a judicious expenditure of £300,000 in diverting supplies from the Macquarie and distributing them through the district between that river and the Bogan would result in increasing the value of the land by about 3½ millions sterling. The Macquarie is only one of a large number of rivers of New South Wales which could be dealt with in the same manner as the Wimmera."

Progress of Water Conservation Work in Victoria.

Such was the opinion given by the New South Wales Water Commission in 1886, since which time the development of water conservation works in Victoria has proceeded at a rapid rate. In that year a comprehensive Act was brought into force in Victoria dealing with the whole subject of riparian rights, and admittedly based on the principles of the draft bill published in the previous

year in the First Report of the New South Wales Water Commission. Up till 30th June of last year ten Trusts had actually been constituted under this Act, the extent of land under their control being 848,620 acres. In addition, 19 applications for the formation of Irrigation Trusts were under consideration at the date mentioned, the gross area affected by them being 1,401,780 acres, of which it was estimated that 1,122,849 acres could be irrigated. A numher of these Trusts have since then been authorised.

Principal Irrigable Areas in New South Wales.

In the accompanying map of New South Wales I have marked the areas in which irrigation can be carried on under advantageous circumstances. The boundaries of these areas are in most cases necessarily approximate only; but they may, on the whole, be accepted as substantially correct. It is to be understood that only a small portion of these areas could be irrigated in any one year; but even with this reservation inspection of them will at once show how discreditable to local enterprise are the famine prices frequently paid for hay, and the importation of Victorian hay and chaff as far as to the Murrumbidgee and occasionally even to the Lachlan. On this subject I may again quote the opinion of Mr. Mair, of Groongal, as given by him to the Water Commission in 1885. Mr. Mair stated that the conclusion he had arrived at as a result of experiments made in the irrigation of a number of different crops was "that irrigation might be profitably used for producing hay, which is bulky, and consequently expensive of carriage; or for raising potatoes or roots which are perishable, or green stuff to feed valuable stock on in time of drought."

In the light of the facts and opinions referred to, it is abundantly evident that by a judicious use of the means at hand we could, within a few years, enormously increase the productiveness of the whole of the Western part of the colony. On this subject the following conclusions were arrived at by the Water Commission after a very extended inspection of the country and an exhaustive inquiry into its capabilities:—"1. That on water conservation mainly depend the prosperity and the development of the whole extent of the Central and Western Divisions of this colony, and that though less required in the Eastern Division, it will add in many places there also in an important degree to the productiveness, and therefore to the value of the land. 2. That as the landholders, as a general rule, are quite equal to the task of providing sufficient water for the stock which the land can carry under present conditions, Government works for supplying water to stock are required only on a limited scale, and generally only on travelling stock routes. 3. That the great object of water

conservation in this colony and particulary in the country west of Dividing Range, is for irrigation. 4. That the purposes for which irrigation is chiefly required, are (*a*) to provide fodder and grain for horses, cattle, and stud sheep; (*b*) to afford surplus supplies to be kept in reserve for saving stock of all kinds in bad seasons; (*c*) to produce fruit, vegetables, and miscellaneous crops; and (*d*) to increase generally the productive powers of the land. 5. That any well-considered and properly executed project for irrigation in the country west of the Dividing Range would afford a good direct return on the capital invested, and would be a distinct benefit to the colony at large. 6. That legislation on the subject of water rights is a matter of pressing necessity, both to protect the rights of the State and to foster and encourage local and private enterprise."

The correctness of these conclusions is beyond dispute, and is thoroughly borne out by the experience of Victoria, where the extension of irrigation is proceeding by rapid strides as already mentioned. Competent authorities are of opinion that the rapid development of the country districts in that colony, and the remunerative returns of the railways, are due to water conservation and irrigation in a much greater degree than is generally understood on this side of the Murray.

It must be borne in mind that the indirect benefits arising from water conservation and irrigation are often far in excess of the direct benefits. A severe drought not only occasions enormous loss in stock during the time it lasts, but frequently leads to the loss of returns for one or even two succeeding years. For instance on the first occasion when I visited the Macquarie District there was a severe drought, which had left scarcely a vestige of grass, with the natural result that the stock had either died or been removed elsewhere. On my next visit I found the grass from 1ft. to 2ft. in height, but there was no stock to eat it, as store sheep and cattle were not to be had at remunerative prices. Cases of this kind are by no means uncommon, and they serve to show the importance of the indirect losses arising from droughts, and to illustrate the causes of uncertainty of the pastoral industry under present conditions.

Want of Legislation.

The greatest obstacle in the way of irrigation is the want of legislation dealing with water rights. In my report on "Irrigation in Riverina," presented to the Water Commission in March, 1887, I referred to this question in the following terms:—"As a means of stifling enterprise by preventing the utilisation of the natural water supply of the country, the British law of riparian rights could scarcely be excelled. For instances of the operation of this monstrous law, we have only to look back on the records

of dams which have been constructed and guarded by armed men, of other dams which, after construction in this way by one armed mob, have been cut through by another; of many cases where dams were needful, but were not built through fear of litigation; and of the purchase of extensive pumping plant which frequently lies idle for the same reason." This is still the state of affairs in New South Wales; but as the necessity for legislation is now universally admitted, it is hoped that the question will soon be suitably dealt with. As matters at present stand nothing can legally be done towards utilising the available supply of water for irrigation. In this matter the people of this colony are placed in the same position as the Government and people of Victoria are in regard to the River Murray. The interests and the necessities of many of our most enterprising western landholders have outweighed their respect for the law, and so it has been with the Government and people of Victoria in the case of the River Murray. Were it not for this disregard of the law on the part of a number of our pastoralists in the Central and Western Divisions of this colony it might be stated with considerable reason that Australian enterprise in the development of the land is bounded on the north by the River Murray.

Necessity of an Examining Board for Engineers.

It is very desirable that legislation dealing with riparian rights and the constitution of water trusts should also provide for the appointment of an examining board of engineers of recognised standing, who would decide as to the qualifications necessary for engineers to water trusts. A board of this description has been in existence for some years in Victoria, and the names of qualified engineers are published from time to time in the official reports of the Water Supply Department. This arrangement is an important measure of protection both to the public and to qualified hydraulic engineers. Some time ago we had a Royal Commission to inquire into abuses in the medical profession. More recently we have read and heard much about abuses among architects, and the only reason why we have heard little about abuses among civil engineers is that, owing to the existing system of centralisation, private and local enterprises are checked and limited, whilst nearly all the available employment for civil engineers is monopolised by Government.

It cannot be too widely known that any person who pleases can style himself "doctor," "civil engineer," "architect," or "surveyor," or he may even adopt all four designations. Doctors' mistakes do not remain in a position to bear damaging testimony, but the mistakes of civil engineers and architects afford evidence which cannot be disputed. In the case of civil engineers, such mistakes

act as a deterrent to private enterprise to an extent which few can realise. It is therefore, very important that in dealing comprehensively with water conservation, the Government should adopt some such safeguard as that in operation in Victoria. When irrigation began to be extensively practised in that colony it was soon found that proper surveys and levels were required to show the lines which channels should take, and the best methods of distributing the water. Even the holders of farms of moderate extent found it greatly to their interest to obtain this information. There are in this colony some station managers who are really good practical engineers, and who are quite capable of managing irrigation work themselves ; but these are only a small minority. As a general rule, station owners and station managers know little or nothing of the process of irrigation, and this is only natural. The greatest mischief to the cause of irrigation is done by those who, without reason, imagine that they understand the subject. Such persons occasionally launch into a series of reckless and misdirected experiments, and after finding such experiments a decided failure financially, they come to the conclusion that the conditions of the country are unfavourable to irrigation. It is necessary to add that cases of this kind are extremely rare, owing simply to the fact, that even with indifferent management and appliances, irrigation gives good returns.

Causes of Backward State of Water Conservation.

The want of proper legislation has been mentioned as a great obstacle in the way of anything being done towards water conservation on a large scale, but the root of all difficulties in the matter is the broad and comprehensive ignorance which prevails on the subject. The people in the western parts of the colony realise its importance and are practically unanimous regarding it, but they constitute a small minority of the population. The great majority of even well-informed persons in Sydney and its suburbs understand nothing about water conservation in the West, and to them it is a much less interesting topic than the Town Hall organ, or the General Post Office clock. Nor are the country towns free from blame in this matter. The building of a new post-office or a courthouse frequently attracts more attention in a town than questions regarding the increase of the productiveness of the entire district in which the town is situated.

The Sydney press has made some creditable efforts to enlighten the public on the value of water coeservation and irrigation, but with only a very limited degree of success. If a series of articles were now published decrying irrigation and stating that it cannot be successfully practised in New South Wales, I believe there would still be found Sydney readers who would go approvingly

through the series and end off with the remark, "I told you so." There was, in fact, much point in the question lately put to me regarding the River Murray by a prominent Victorian,—"Do you think we in Victoria are such fools as to postpone our works for perhaps fifty years till the Sydney people find out the value of the Murray?" There is no vagueness or mincing of matters in that question, and the accompanying map (republished with this paper by the kind permission of the Hon. Alfred Deakin, Minister for Water Supply, Victoria,) will show that the action taken has been as decided and energetic as the question would indicate.

The explanation of the backward state of affairs in this colony regarding water conservation is very simple. While the indirect results of a national system of water conservation would be enormous, and would add greatly to the wealth and prosperity of the colony, the number of persons directly affected in the first instance would be relatively small. Hence we find that the question is regarded with comparative apathy by the many, and receives the cordial support of only a few. Besides, the landholders of the coastal districts, who enjoy an abundant rainfall, have a selfish interest in opposing water conservation in the interior of the colony. But the spread of information and the remarkable progress made in the Northern Districts of Victoria must soon have their effect. Many in Sydney are beginning to see that a drought which occasions losses in the interior of the colony to the extent of millions sterling, must have some effect on their business, and the spread of such ideas cannot fail to lead to action.

Statistics relating to Losses.

The following figures, illustrating the importance of the subject dealt with in this paper, speak for themselves:—Number of sheep in New South Wales on December 31, 1886, 39,169,000; number of sheep in New South Wales on December 31, 1887, 46,965,152; number of sheep in New South Wales on December 31, 1888, 46,503,469. The year 1887 was a good one for pastoralists, and 1888 unfavourable. Inspection of the figures shows that the number of sheep at the end of 1888 was about ten millions less than if the rate of increase of the previous year had been maintained—in fact, instead of an increase of that amount, we find that there was a decrease of nearly half-a-million. Some idea of the proportion carried off by starvation and thirst may be conveyed by the statement of a writer in one of the Sydney papers, who declares from personal knowledge that on one station 60,000 sheep were lost in this way last year out of 120,000, and on another station 80,000 out of 150,000. The same writer estimates that the number of lambs shorn this year will be 2,000,000 less than last year, on account of the drought, and that for the same reason the wool throughout the country north and west of the Lachlan

will be inferior in quality. The practicability of preventing, in an important degree, the recurrence of such losses is not a matter of theory or of opinion, but an ascertained fact.

Discussion.

Judge Docker.—I think Mr. M'Kinney is to be congratulated upon the able paper he has read on this important subject; and the pastoralists of the colony ought certainly to appreciate the way in which the subject has been treated, being as it is, one of such vast importance, not only to them but also to the whole colony. Any one who is acquainted with the portions of the colony referred to, must appreciate the exhaustive way in which Mr. M'Kinney has argued the question out. I am tolerably acquainted with a portion of the country he has referred to, and consequently his remarks have been of the greatest interest to me, and have borne out many ideas which have also occurred to me and which I have endeavoured, perhaps imperfectly, to express. This part of the colony (referring to the Darling on the map) is one that has always had great interest for me; indeed I regard it as the Nile of Australia of the future. I believe from the fertility of the land it will be capable of growing almost any sort of produce. I am very glad to hear Mr. M'Kinney's calculations as to the amount of fodder which that narrow strip would grow for the purpose of keeping alive the stock over all the vast district adjacent. In addition to the river itself, there are many lakes running back from the river which would form reservoirs for flood waters which could be used when the river falls. The river itself in its natural state does not contain a very great quantity of water as a general rule. I remember hearing of a case in which a gentleman at a station was irrigating some land—pumping up water from the river by means of a power pump—and after a few days' pumping he found he had lowered the river locally by about two feet, the country being so level and the flow so low—he had actually made a hole in the river as it were. With regard to the portion of the colony between the Macquarie and the Bogan there can be no doubt, so far as distribution is concerned, this is a most favourable part of the colony for irrigating the country, as it is so level and there are so many creeks. I remember some years ago travelling up the Duck Creek from Bourke to Dubbo, and being caught by the flood waters coming down, there not having been a proper rain for months. When we were a little way beyond Cannonbar we met a flood coming down the whole surface of the country, and after waiting a few days we started and travelled I think about forty miles up the Macquarie through water three to four inches deep. The difficulty was to find any portion of the surface at all above the level of the water. The grass showed just above the

water, so that we could see where we were going, and as I say we travelled almost through a layer of water three to four inches deep. But what strikes me as a difficulty with regard to this part of the country is that the water supply would not be continuous. This vast body of water flows at irregular times, and there would require to be some storage to apply the water at the time it was required. Whether there are places which would be capable of being used as a reservoir in this part of the country I am not aware. Probably Mr. M'Kinney knows more about that than I. Another part of his paper is of great interest to me and I can bear out every word of Mr. Boultbee's description of this country. It is a most vivid and accurate description of the nature of the country, and of what happens in time of drought. But as only a comparatively small portion of this vast pastoral country can be directly benefitted by irrigation, only a small portion being capable of being irrigated, various supplementary methods of preserving the lives of the stock should be adopted. Of course one obvious method is that mentioned by Mr. M'Kinney, that the more valuable of the sheep should be brought to the various areas along the River Darling and other places where a supply of fodder could be procured. Mr. Boultbee mentioned that in some places the sheep were taken from the parts suffering from drought to the mountains. This is very frequently done, but is not carried out in a systematic way at all. As a general rule the sheep are kept in the hope that rain is coming and grass will be growing until they are unfit to travel. They become so weak and the roads become so utterly bare that there is nothing for them to eat *en route*. It has long occurred to me that the system carried out in the plains of Spain should be adopted here of moving the sheep, not merely in the time of drought, but annually making it a regular part of the business to remove them, say, immediately after the shearing to the high lands of the colony, where as a rule there is plenty of grass. In winter time in the New England District the sheep suffer from fluke, in some places they cannot remain all the year round, but during the summer time there is generally an abundance of grass and water. But then the difficulty arises of travelling sheep such a vast distance, and here is the idea I have tried to impress upon many, and had the honour recently to bring under the notice of the Minister of Works. My idea is that the railway system of this portion of the colony should be adapted specially with the view of serving the pastoral industry by affording facility to carry the stock by train. I think by taking the railway from Nevertire, crossing the Macquarie at Warren to Coonamble, from thence to the Namoi and joining at Pilliga an extension of the North-Western Railway, the Western should be connected with the Northern Railway system. The western plains

would then be connected by rail with New England, and from Nevertire right away to Glen Innes trains could be run in less than 24 hours to the heart of the mountain country, where there is abundance of grass during summer, and this would keep many sheep to the acre for the few months it would be necessary for them to be taken there. Then they could be taken back again for the lambing by which time there ought to be a growth of grass, rain generally being expected about February or March. By this means pastoral industry would be rendered more of a certainty and less of a lottery ; and many more sheep to the acre could be carried all the year round by utilising the plain country and the mountainous country together—working the two in conjunction. Then of course the system of feeding the sheep on artificial fodder could be most usefully adopted. This has been a most serious item during the prevalence of droughts in the Darling River. In one place no less than £1,200 was spent during the year in providing food for the horses on the station alone—no attempt was made to feed the sheep. The cost of bringing chaff was simply enormous. On one occasion I had to pay for a 40lb bag of chaff to feed my horses 25s. At another place lower down the horses were being kept alive on flour. The river ceased to become navigable, and though flour was selling at £60 a ton at Wilcannia there was a cargo of flour which could not be got there, the river having failed. No teams could travel that distance and the owner of the flour sold his whole cargo to the owners of the station at £20 a ton, and it was mixed with some of the natural fodder. I make these remarks to call the attention of those interested to the necessity of having more than one system in working the pastoral industry. No doubt the irrigation system is the most important, and if the railway communication of this district were made to fit in with that particular industry it would be rendered much more certain and profitable, and especially stock would be kept alive with a much greater degree of certainty.

Professor E. H. Rennie.—I listened with a great amount of pleasure to the reading of this paper. I would like to refer to one aspect of the question to which allusion was made, that is to the possibility of interference with the navigation of the lower Murray if these enormous irrigation works are carried out. People in South Australia are I know somewhat agitated upon this point, and I believe this colony sent a commission into Victoria some time ago and some figures were published as to the amount of water that would be carried away by Victoria for irrigation purposes. I would like to have the opinion of Mr. M'Kinney—whether he thinks there is any fear of interference with navigation.

Mr. Trevor Jones moved a vote of thanks to Mr. M'Kinney. He said he hoped the public press would call the attention of the

public to the points raised by Mr. M'Kinney in his paper. We had a splendid territory, but had allowed it to fall almost into disuse and were consequently far behind Victoria in the matter of irrigation. He did not think the locking of the Darling would interfere with the navigation of the lower Murray. He took it that when the river is locked water is kept in it throughout a greater portion of the year, He thought that the locking of the Darling would tend to keep the waters in the lower Darling and the Murray.

Mr. J. T. WILSHIRE, M.P., in seconding the vote of thanks said he fully endorsed Mr. M'Kinney's remarks with regard to the necessity of legislation in the matter. He sincerely hoped that during the next session of Parliament a Bill would be introduced by the Government.

Mr. P. N. TREBECK said the squatters in the Western District had tried sending their sheep up to the mountains as suggested by Judge Docker, but they invariably came back infected with fluke. He therefore preferred Mr. M'Kinney's scheme of irrigation as a more practical means of grappling with the difficulty.

Mr. M'KINNEY in reply said he was gratified at the corroboration of his opinions by Judge Docker, whose experience of the western part of the country probably even exceeded his own. With regard to the question asked by Professor Rennie, he would not go so far as to say that he thought that irrigation would put a stop altogether to navigation, but he thought it would interfere with it to a considerable extent, as the quantity of water to be taken would be so great. In Victoria, however, people were quite reconciled to the idea of navigation being seriously interfered with, believing that much greater good would result from irrigation.

Mr. J. TREVOR JONES desired to explain that he meant that if the Darling and the Macquarie were locked in the manner indicated in the paper, that though the pumping would diminish the quantity of water in the rivers, yet that the quantity conserved by the locking would to a certain extent compensate for that taken away by the pumping.

The Chairman, Professor LIVERSIDGE, in thanking Mr. M'Kinney on behalf of the meeting for his valuable paper hoped that the public press would give that prominence to the subject which its importance warranted.

Mr. M'KINNEY briefly acknowledged the vote of thanks.

JUDGE DOCKER desired to say a word in explanation. No doubt, as stated by Mr. Trebeck, there was a danger of the sheep contracting the fluke; but if they were taken up to the mountains during the summer time they were less likely to catch the disease. He had always understood too, that sheep which were affected with fluke were cured by being taken to the salt-bush country.

WEDNESDAY, AUGUST 7, 1889.

Sir ALFRED ROBERTS, Vice-President, in the Chair.

Thirty members were present.

The certificates of two candidates were read for the third time, and one for the first time.

The following gentlemen were duly elected ordinary members of the Society :—

De Lambert, J. Labat, M.D., *Paris ;* Waverley.
Hull, Walter, M.D., *Lond.*, M.R.C.S., *Eng.*, L.R.C.P., *Lond. ;* Sydney Hospital.

Mr. H. C. Russell, B.A., F.R.S., read a paper on "The Source of the Underground Water in the Western Districts."

A discussion followed in which Messrs. H. G. M'Kinney, F. B. Gipps, Prof. Warren, S. Pollitzer, and P. N. Trebeck took part.

A paper by Prof. F. W. Hutton, F.G.S., "On the Eruptive Rocks of New Zealand" was taken as read.

Mr. P. J. Edmunds read a paper "On the application of Prismatic Lenses for making normal-sight magnifying spectacles."

Remarks were made by Prof. Warren and Dr. Schwarzbach.

Mr. L. Hargrave read a paper on "Flying-Machine Memoranda."

Some remarks were made by Mr. Russell.

The thanks of the Society were accorded to the various authors for their valuable papers.

The Chairman made the following announcements :—

1. That the Council had awarded the Society's medal and money prize of £25 to the Rev. John Mathew, M.A., Coburg, Victoria, for his paper upon "The Aborigines of Australia."

2. That the President and Council had decided to give a 'Reception' to the members on the 21st inst., in the Society's Hall, for conversational scientific discussion, and the exhibition of specimens of special interest.

Similar meetings had been held on previous occasions and were a marked success ; and the Council trusted therefore that the members would enjoy an equally agreeable evening on the 21st inst.

It was a source of regret to the Council that they were unable to extend their invitation to the ladies of the families of the members, but the accommodation at their disposal unfortunately rendered this impossible.

3. That in connection with the Clarke Memorial a course of three Lectures to the members of the Royal Society of N.S.W., would be delivered at the Society's House, by C. S. Wilkinson, F.G.S., Government Geologist, upon the Geology of Australia, commencing on Wednesday, November 13, at 4:30 p.m. :—

LECTURE I.—On the Geological researches of the late Rev. W. B. Clarke, M.A., F.R.S., S. Stutchbury, and other early Australian Geologists; Wednesday, 13th Nov., at 4:30 p.m.

LECTURE II.—On the Geology and Ancient Life-History of Australia; Wednesday, 20th November, at 4:30 p.m.

LECTURE III.—On the Economic Geology of Australia; Wednesday, 27th November, at 4:30 p.m.

The following donations were laid upon the table and acknowledged :—

DONATIONS RECEIVED DURING THE MONTH OF JULY, 1889.

(The Names of the Donors are in *Italics*.)

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THE ERUPTIVE ROCKS OF NEW ZEALAND.

By Professor F. W. Hutton, Hon. Mem. R. S. of N. S. Wales.

[With One Plate.]

[*Read before the Royal Society of N.S.W., August 7, 1889.*]

Rocks are defined as mineral aggregates. It is natural, therefore, for the student to think that when the minerals composing a rock have been accurately determined, the name to be applied to the rock will follow as a matter of course. This however is by no means always the case. The minerals composing a rock may be known and yet considerable difficulty may be experienced in deciding by what name to call it. This difficulty arises partly because the relative proportions of the different minerals have often to be taken into consideration, and partly from the same rock-name having been used in different senses by different geologists, so that it is difficult to decide whom to follow. The confusion, indeed, has become so great that some petrologists discard names as much as possible and in their place give a list of the

minerals composing the rock. This plan has the merit of not adding to our confusion, but it will not help us out of it. And when we read of 'Plagioclase-augite-olivine-mica Rock,' or of 'Felspar-pyroxene-magnetite-garnet Rock,' our patience is well nigh exhausted.

Natural Science progresses by the comparison of objects, and when objects are numerous they must be named, if for no other purpose, still for indexing; so that an observer may readily find descriptions of similar objects for comparison and ascertain what others have said about an object similar to the one he may be studying. As books get more and more numerous a uniform nomenclature becomes of more and more importance from the single point of view of indexing, and until some uniformity in rock nomenclature has been attained we cannot expect any very great advance in petrology.

The difficulties attending the classification of rocks are inherent in the subject and further knowledge will not lessen them. In Biology we now know that all organic beings are connected together by the law of heredity which gives the clue to a natural system of classification. If geology contains any analogous principle it can only be that the materials composing the interior of the earth have some definite arrangement and that eruptive rocks are specimens shewing the composition of the materials at different depths. This, which is the theory of Bunsen and Durocher more or less modified, has led to our present classification of basic, intermediate, and acidic rocks; that is to a classification founded on chemical composition. The opposite theory of Scrope and Von Richthofen, that basic and acidic rocks are due to liquation in a magma of intermediate composition, also leads either to the same chemical classification or to one in which the rocks formed in each geographical area during an eruptive period would be put into a separate group. But this latter method would manifestly be a very unnatural classification, for we should have to put identical rocks into different groups: consequently the establishment of one or other of these theories would give us no new help in the classification of rocks, for under any circumstances grouping together those rocks which have a similar chemical composition must always be the nearest approach to a natural system which we can expect in petrology.

Again among rocks there is no process analogous to natural selection, by which intermediate varieties have been eliminated, so that in petrology no rock-group is distinctly marked off, but each passes gradually into others. As also any rock may pass on the one hand into rocks of similar texture but of different chemical composition, and on the other hand into rocks of dissimilar texture but of similar chemical composition, it is evidently impossible to

shew all the their relations by a linear series. Under these conditions every system of rock classification must be more or less artificial, and must be devised principally for convenience. And the one that is on the whole the most convenient—that is the one that gives the most information as to the composition and geological position of a rock, combined with a nomenclature as little cumbersome as possible—that system will be the best.

The present paper includes the results of the microscopic examination of about 250 rocks, but it is merely a commencement. A rich harvest awaits petrologists in New Zealand, which will take many years and many workers to gather in. Instead of stating what is known or thought about the age and geological position of the rocks, which would have involved much controversy, I have given full references to the reports, papers, and books in which they are mentioned. All measurements are in inches or decimal parts of an inch. Most of the specimens were collected by myself, but a few have been given me by friends, particularly by the late Sir Julius von Haast.

To avoid adding to the existing confusion in nomenclature I have followed Dr. A. Giekie and Mr. J. Harris Teall in the larger divisions of rocks, while in defining the groups I have taken Dr. A. Giekie, Mr. Teall, Professor Bonney and Professor Wadsworth as my guides so far as the unaltered rocks are concerned. The nomenclature of the altered eruptive rocks is in a complete state of disorganisation and any arrangement at present must be provisional. To tide over the difficulty I have placed each altered rock in the group to which it probably belonged when fresh, and have distinguished, to some extent, the changes which it has undergone by prefixing the adjective 'Chloritic' to denote hydrothermal metamorphism and either 'Saussuritic' or 'Schistose' to denote dynamic metamorphism.

> "But my flag is not unfurl'd
> On the Admiral-staff, and to philosophise
> I dare not yet."

Consequently I have not felt justified in departing widely from custom by carrying out this method consistently. Probably Dr. Wadsworth's suggestion of placing some name—such as Diabase or Melaphyre—to denote the kind of alteration, after the name of the group is a better method; but on trying to carry it out in practice I found that it would necessitate so many alterations from the usually received nomenclature that my courage failed me.

The Granitoid eruptive rocks present a continuous sequence from Granite, in which silica may form over 80 per cent. of the rock and the iron oxides be very small in quantity, to Siderolite in which there may be no silica and metallic iron may form 98 per cent. of the whole. In this sequence potash, soda, lime, and

magnesia attain their maxima at different parts. Some geologists place in separate divisions those rocks which contain nepheline or leucite, and those which go by the name of Mica-trap, or Lamprophyres. But while the former of these divisions may conveniently be kept separate, the latter appears to be provisional only, and will no doubt, be merged into the main sequence. No member of the Nepheline-leucite division has as yet been described from New Zealand,* but the main sequence is very fully represented.

Omitting then the Nepheline-leucite Rocks, the *Class* of Massive Eruptive Rocks is here separated into three *Divisions* by the nature of the felspars when present, or by their absence and each division is broken up into two or more *Series* by chemical composition. These series are again divided by macroscopic texture into *Groups* to which distinguishing names are given. The groups are separated into *Species* by the ferro-magnesian silicates they contain, and, when necessary, these are again subdivided by microscopic texture into *Varieties*. The name of the species is obtained by prefixing the name of the ferro-magnesian silicate, or muscovite when ferro-magnesian silicates are absent, to that of the group ; but for brevity only the most important ferro-magnesian silicate is named. The question arises here, Which is to be considered the most important ferro-magnesian silicate when more than one are present? I have answered this question by selecting the one which is most rarely found in the group, because attention is thus directed to it. For example: nearly all the andesites contain augite, therefore I limit the species Augite Andesite to those andesites which contain no other ferro-magnesian silicate; and when a second is present it gives the name to the species. In the Trachyte group hornblende is the common ferro-magnesian silicate, and in the Rhyolite group it is biotite.

In the non-crystalline rocks the species depend upon texture or on chemical composition. Varietal names are usually not indicated but can easily be formed by adding the texture name. The classification is, therefore, founded on chemical composition and texture, but a chemical analysis is not generally necessary for naming a rock. Usually its chemical composition can be estimated with sufficient accuracy by a knowledge of its mineral composition and its specific gravity. It is only in doubtful cases that an analysis must be resorted to.

I am quite aware of the objections that can be urged against this classification ; objections founded on the varying chemical

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* Mr. W. Skey mentions a leucite basalt from near Castle Point on the east coast of Wellington (Col. Mus. and Lab. Reports, No. 10, p. 48), and Professor Ulrich read a paper to the Otago Institute "on some Nepheline bearing rocks from Dunedin" (Trans. N. Z. Inst., Vol. xxi., p. 522), but no description has been published of either.

composition of the same rock-mass either from the absorption of foreign rock, or by the liquation of its minerals, or by infiltration; but it appears to me to be the most convenient arrangement yet proposed, and one that is not open to more objections than can be made to any other. And also it is, I think, the one most generally used. To apply it consistently, however, compels the rejection of binary terms—such as Quartz-felsite—for the groups, and in the selection of names to replace them geologists should be guided by the rules which have conferred so much benefit on nomenclature in Biology. It may be unimportant by what name we call a rock, but it is very important that all geologists should call it by the same name, and that no new name should be proposed as a substitute even if the new name be more classically formed. And it is the law of priority, so strongly and so wisely insisted on by biologists, which alone can give us permanency in nomenclature. No doubt euphony should be considered when making a new name, but it is of little real importance. Respect for the law of priority is the only way by which we can escape confusion. Perhaps the less a name suggests the better it is. Many names in Biology are taken from ancient mythology or ancient geography, and these names have been found in practice to be quite "as good as the best" although they refer in no way to the animal or plant named. My greatest difficulty has been with the name Felsite, which has been used for so many different kinds of rock as to carry with it only the vaguest of meanings. Its principal components are devitrified obsidians or rhyolites, and the term 'felsitic' is commonly used to describe the texture so characteristic of devitrified glass. I have therefore thought it best to discard Felsite as a group name and use it for the felsitic obsidians only.

Chemical analysis is rarely available as a help towards the classification of the New Zealand eruptive rocks and I have had to depend almost entirely on mineral composition and specific gravity. In most cases these are sufficient, but there are some rocks which cannot be accurately named without a knowledge of their chemical composition, and with these I may often have judged wrongly. Still I think it better to risk making mistakes, which can be subsequently rectified, than to omit altogether the doubtful cases.

With altered rocks mineral composition furnishes a better clue to their proper position than any chemical analysis can do, for by means of pseudomorphs, we can, to some extent, recall their former composition, which chemical analyses would altogether fail to accomplish. For the student must remember that in the definitions of the series and groups the characters relate to fresh, unaltered, rocks only. Different parts of the same rock, if it has undergone metamorphism or decomposition, may differ widely in their chemical composition, in their specific gravities, or in their mineral com-

positions. To find the place of an altered rock in the scheme it is necessary to attempt to restore, in imagination, the rock to its condition when it was first erupted, a difficult and sometimes even a hopeless task. Even with fresh rocks the student may often come across one which does not agree with all the characters given for any of the series, He must then place the rock in that series to which it has the greatest affinity, and not attempt to alter the characters of the series to fit it. These characters depend on the average composition of a large number of specimens and are types only.

To prevent ambiguity I give definitions of the terminology used in describing the textures of rocks, and as I cannot hope to give good figures of these textures from New Zealand rocks, I have given references to the plates in Mr. J. H. Teall's "British Petrography"; to those illustrating Professor Judd's paper "On the tertiary Gabbros, Dolerites, and Basalts of Scotland and Ireland," in the Quarterly Journal of the Geological Society of London, Vol. XLII., p. 49; and to some of the woodcuts in Mr. Rutley's "Study of Rocks," and Dr. A. Geikie's "Text Book of Geology" 1885. I have, however, given figures of Gregaritic and of Trichitic textures, because I am responsible for these names.

Rock Textures.

A rock may be either uniform in texture—when, if it is crystalline, it is called *granular*—or it may be *porphyritic*; that is larger crystals may be scattered through a uniform *ground-mass*.

The porphyritic minerals may be—

Idiomorphic—with crystalline faces. Teall, pl. xxiii., f. 1; pl. xxxvii., f. 1 and 2.

Allotriomorphic—without crystalline faces. Teall, pl. xvi., f. 1 and 2.

Glomero-porphyritic—granular aggregates with independent orientation. Judd, pl. vii., f. 3.

The uniform rocks, or the ground-mass of the porphyritic rocks, may be *holocrystalline*, i.e., the crystals touching each other; or *semi-crystalline*, i.e., the crystals separated by a glassy *base*, more or less abundantly developed: or they may be *non-crystalline*, i.e. the base may form the whole rock and contain no crystals.

There are four macroscopic textures—Granitic, microgranitic, trachytic, and amorphous—under which the microscopic textures and subtextures can be arranged.

Granitic—Holocrystalline, the crystals large, from ·01 inch upwards, the larger crystals usually predominating. Plagioclase is usually in broad plates, when in lath-shaped crystals they are not less than ·08 by ·02 inch. Usually granular, but sometimes porphyritic. Teall, plates xviii., xix., xxv., xxxv., &c; Judd, pl, iv., f. 1 to 4; Geikie, fig. 10. The microscopic textures are

Granulitic (Michel-Lévy); the quartz in approximated, allotriomorphic grains, small, of nearly the same size, and independently oriented. Teall, pl. xlii., f. 1 and 2.

Ophitic; approximated grains of a mineral, usually augite, with uniform orientation enclosing, or partly enclosing, crystals of another mineral, usually felspar, which have independent orientation. Teall, pl. xxix., f. 1.

Pegmatitic: two minerals, usually quartz and felspar, in irregular, alternating, layers; each layer formed of approximated grains with uniform orientation. *e.g.* Graphic granite.

Centric: The same as pegmatitic but the layers assuming a more or less radiating arrangement and forming *Pseudospherulites.* Plate viii., f. 1.

MICROGRANITIC—Holocrystalline, the crystals small but clearly defined. In orthoclase rocks the crystals range from ·006 to ·001 inch, usually averaging about ·003. In plagioclase rocks the felspars give lath-shaped sections which range from ·07 to ·01 inch in length; while the augite grains are from ·03 to ·006 in diameter; but no strict rule can be laid down. Either granular or porphyritic. Teall, pl. x., f. 1; pl. xxix., f. 1; pl. xxxi., f. 2; pl. xxxiii., f. 1; Judd, pl. iv., f. 7 and 8. The microscopic textures are *

Granulitic (Judd): augite grains either separated or in small clusters, but always independently oriented. Judd, pl. v., f. 2.

Gregaritic: augite grains of the ground-mass forming marked clusters with independent orientation. Pl. viii., f. 6.

Ophitic: same as in granitic, but on a smaller scale. Teall, pl. x., f. 1; Judd, pl. v., f. 1.

Micropegmatitic: same as pegmatitic but on a small scale. Teall, pl. xxiii., f. 2; pl. xxxv., f. 2; pl. xlvii., f. 5.

TRACHYTIC—Semicrystalline; usually porphyritic, but sometimes granular. The microscopic textures are

Microlitic: composed of closely compacted microlites of different minerals, with little or no amorphous base. The felspar microlites are from ·015 to ·001 in length and less. The augite microlites are either prisms about ·015 by ·005, or they are grains about ·004 to ·001 in diameter. Teall, pl. xxiv., f. 2; Judd, pl. v., f. 3 and 4. Sub-textures are

Microgranulitic: granulitic (Judd) on a small scale. Judd, pl. v., f. 6.

Microgregaritic: gregaritic on a small scale. Pl. viii., f. 7.

Micro-ophitic: ophitic on a small scale. Judd, pl. v., f. 5.

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* The Chondritic texture peculiar to meteorites is omitted.

Crystallitic: a glassy base so crowded with crystallites as to be turbid or opaque, surrounding microlites or small crystals. Teall, pl. xxiii., f. 1; pl. xxxvi. and xxxvii. Sub-textures are

Longulitic: the crystallites are colourless, or pale coloured rods and irregular particles (Micro-felsitic).

Globulitic: the crystallites are opaque granules of iron oxides.

Vitreous: a clear glass, colourless or brown, through which crystallites and microlites are loosely scattered. Teall, pl. xxxiv., f. 3 and 4; Judd, pl. vi., f. 3 to 8. Subtextures are

Banded: divided into layers of different colours. Teall, pl. xxxiv., f. 1; Rutley, f. 74a.

Damascened: contorted layers and threads of different colours. Rutley, f. 75.

Perlitic: with microscopic curved cracks, sometimes between straight crack. Teall, pl. xxxiv., f. 5; pl. xxxviii., f. 1; Giekie, f. 22; Rutley, f. 76.

Spherulitic: containing spherical bodies with a radial fibrous structure. Teall, pl. xxxix., f. 1; Giekie, f. 22.

Microspherulitic: The same but visible with a microscope only. Teall, pl. xxxviii., f. 2.

Axiolitic: containing elongated bodies, sometimes branched with fibres at right angles to the long axis. Rutley, f. 79.

Microresicular: containing microscopic vesicles, either rounded *(cellular)*, Giekie, f. 28, or elongated *(pumiceous)* pl. viii., f. 2, or hair-like *(trichitic)* pl. viii., f. 3.

Felsitic: an anisotropic aggregate without definite microlites; either transparent or turbid with crystallites. With or without a grey and white mosaic-like pattern visible only between crossed nicols (petrosiliceous). This is a devitrified* glass, and the subtextures are the same as in vitreous-textures.

Amorphous—Non-crystalline, glassy or stony, non-porphyritic. This is the base of the crystallitic, vitreous, and felsitic semi-crystalline rocks and it has the same textures and subtextures.

These various textures pass into each other and occasionally a rock may be partly of one and partly of another texture. This is especially the case with crystallitic and vitreous.

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* The term devitrified is here limited to those rocks which have once been solid colloid glass and have changed subsequently, (secondary devitrification); it does not include changes which take place during the original cooling of a glassy magma from the molten condition (primary devitrification) and which give rise to crystallites and microlites.

TABULAR VIEW OF THE ROCK GROUPS.

	Orthoclase Rocks.		Plagioclase Rocks.		Non-Felspathic Rocks.				
	Potash-soda Series Silica Max.	Soda-potash Series Potash Max 5 to 7 p.c.	Lime-soda Series Soda Max. 3 to 5 p.c.	Lime-magnesia Series Lime Max. 7 to 14 p.c.	Magnesia-lime Series. Without olivine.	Magnesia-lime Series. With olivine	Magnesia-iron Series M'nesia Max. 30 to 47 p.c.	Iron-magnesia Series.	Iron Series Iron Max.
Silica	82 to 65	65 to 55	65 to 55	55 to 43		46 to 37	40 to 32	30 to 5	5 to 0
Iron and its Oxides ...	1 to 2·5	2·5 to 8	6 to 13	9 to 18		10 to 16	25 to 30	43 to 80	80 to 95
Specific Gravity	2·3 to 2·7	2·5 to 2·9	2·6 to 2·9	2·6 to 3·2		2·85 to 3·2	3·2 to 3·8	3·5 to 3 8	7·5 to 7·9
Granitic Texture	Granite	Syenite	Diorite	Gabbro	Pyroxenite	Picrite	Peridotite	Pallasite	Siderolite
Microgranitic Texture ...	Elvanite	Orthophyre	Porphyrite	Dolerite	Name doubtful.		None known.		
Trachytic Texture... ...	Rhyolite	Trachyte	Andesite	Basalt			None known.		
Amorphous Texture... ...	Obsidian	Not known in independent rock masses.		Tachylyte			None known.		

Division I.—ORTHOCLASE ROCKS.

Orthoclase (including microcline and sanidine) is always present generally accompanied by plagioclase (albite or oligoclase). Mica or hornblende, or both, are usually present. Augite and enstatite are rare. The potash is more than or equal to the soda.

POTASH-SODA SERIES.

Silica 82 to 65 per cent.; iron oxides 1 to 2·5 per cent. The lime and magnesia together are less than half the alkalies, and less than one-fifth of the alumina. Specific gravity 2·3 to 2·7. Quartz is always present except when the base is very abundant, in which case it may be absorbed.

GRANITE GROUP.

Granitic compounds of quartz, orthoclase, and mica; usually with plagioclase, and sometimes with hornblende or augite. Usually granular, but sometimes with porphyritic crystals of orthoclase.

Biotite Granite.

A.—With Muscovite.

Oreti, Inangahua County.—White or pink, of medium grain, and with small crystals of biotite and muscovite scattered sparingly. Specific gravity 2·6 – 2·62. Section: Quartz, orthoclase, plagioclase, biotite, muscovite, and a little magnetite. The quartz is partly in allotriomorphic grains from ·03 to ·10 in diameter, shewing pressure granulation. The felspars are from ·02 to ·10 in length; some of the orthoclase shews crosshatching. Biotite is more abundant than muscovite. Secondary minerals are haematite in minute grains colouring the felspars or quartzes; magnetite after biotite and a little chlorite. A colourless mineral, perhaps perofskite, occurs occasionally. Park, Reports Geological Explorations 1887-8, p. 83.

Lyell, Buller County.—A coarse grained rock with white felspar and both biotite and muscovite in about equal quantity. Specific gravity 2·64. Section: Quartz, orthoclase, muscovite, and biotite. The quartz is partly in large grains about ·08 in diameter and partly granulitic, the grains ·0005 to ·015, but does not shew pressure granulation distinctly; the fluid inclusions are small. The orthoclase crystals are about ·18 in length, microcline occurs commonly. The quartz contains greenish hair-like crystals, sometimes branched. Other accessory minerals are zircon and apatite. From the road cutting at the south-east end of the town. Where this granite comes in contact with sedimentary rocks it passes into Elvanite, fine grained, brownish-grey, without any biotite. The felspar is allotriomorphic, and the quartz shews pressure granulation. Hutton, Trans. N.Z. Institute, Vol. XXII.

Cape Foulwind, Buller Co.—A coarse grained. grey rock, with biotite rather abundant. Sometimes with porphyritic crystals of orthoclase up to two inches in length but allotriomorphic. S.G. 2·61 to 2·62. Section : Quartz, orthoclase, plagioclase, biotite, and muscovite. The quartz is chiefly granulitic, the grains about ·04 in diameter but it shews strong pressure granulation, and much of it is reduced to grains ·005 in diameter ; it surrounds the felspars and biotites. The orthoclase is generally allotriomorphic ; plagioclase in subordinate quantity only. The biotite is uniaxial ; the muscovite in small quantity. Plagioclase, muscovite, zircon, and apatite occur as inclusions in the orthoclase. The gas- and liquid-cavities in the quartz are small.

The porphyritic orthoclases are elongated in the direction of the ortho-diagonal. They consist of narrow alternating layers of orthoclase and microcline parallel to the clino-pinacoid, with irregular bands of another felspar (probably albite) roughly parallel to the ortho-pinacoid. The polarization colours are lowest on the orthopinacoidal section, and most brilliant on the basal section. Specific gravity 2·550. This granite often contains fragments of much altered clastic rocks, some of which are surrounded by a layer of biotite. The granite of Lake Brunner has a very similar appearance but I have not made a microscopic examination.

B.—Without Muscovite. (Granitite.)

Port William, Stewart Island—A rather fine grained rock of a brownish-grey colour, with brownish felspar and black biotite rather abundant, but irregularly scattered. S.G. 2·626. Section: Quartz, orthoclase, plagioclase, biotite. The quartz is rarely above ·04 in diameter, usually about ·015, and does not shew pressure granulation. Orthoclase up to ·13 ; plagioclase is quite subordinate. Cross-hatching of microcline is plainly seen on some of the felspars, while others have a coarser structure like polysynthetic twinning on both albite and pericline types. Sphene occurs occasionally and a little chlorite after biotite.

Lake Poerua, Westland—A rather fine grained, grey, rock with white felspar and small biotites rather abundant. S.G. 2·65. Section : Quartz, orthoclase and biotite. The quartzes are rarely under ·02 but in places shew pressure granulation very distinctly. The orthoclase has the cross-hatching of microcline. There is no plagioclase. Biotite is abundant, from ·03 to ·04 in diameter. There is a little chlorite.

Denniston near Westport—A fine grained rock, with grey felspar and very abundant small crystals of biotite. S.G. 2·70. Section: Quartz, orthoclase, plagioclase, and biotite. The quartzes are large, ·16, rarely under ·015, and shew no pressure granulation. They contain small gas- and liquid-cavities in bands. The orthoclase is

generally idiomorphic and with anomalous extinction. Plagioclase is rare. The biotite is distinctly biaxial. Apatite occurs as an accessory and there is a little isotropic chlorite. This rock is found on the road from Waimongaroa to Denniston and traverses sandstones and slates which, from lithological characters, I judge to belong to the Hokanui System.

Muscovite Granite.

Lower Buller Gorge—A coarse grained rock, passing in places into Giant Granite ; of pink felspar, white or sometimes pink quartz and large plates of muscovite. S.G. 2·6 to 2·64. Section : The quartz contains few fluid cavities and shews pressure granulation. The felspars are both orthoclase and plagioclase. Pale brownish garnets, about ·006 in diameter, occur occasionally. Forms segregation veins in Schistose Granite, and therefore, is not a true rock.

Malvern Hills, Selwyn Co.—A medium grained, pale grey rock consisting of quartz and felspar. Section : Quartz, orthoclase, plagioclase and a little muscovite, with centric texture. The quartzes are from ·08 to ·02 in diameter, the smaller ones being the commoner ; there is no pressure granulation. The felspars go to ·06. Apatite is present as an accessory mineral. The pseudo-spherulites go up to about ·3 in diameter. They are composed of irregular radiating crystals of clear quartz and of a pale brownish mineral, which is fibrous, slightly pleochroic and has straight extinction. It was considered by Mr. Daintree to be prehnite. These pseudo-spherulites are sometimes surrounded by a band of translucent brown quartz, which extinguishes simultaneously and is polyhedral. (Plate viii., fig. 1.)

This rock occurs in loose blocks on Highpeak, and has not been found in situ. My specimen shews a junction with the rhyolites found in the same range. Haast, Reports Geological Explorations 1871-2, p. 16, and Geology of Canterbury and Westland, p. 288, (Syenitic Granite Porphyry). Daintree, Trans. N.Z. Institute, Vol. vii., p. 459, No. 348.

Hornblende Granite.

Omaru Creek, Clutha Co.—A rather fine grained, grey rock, with white felspar and abundant black hornblende. S.G. 2·67. Section: quartz, orthoclase, plagioclase and hornblende. The quartzes are from ·10 to ·02 in diameter ; some of them contain curious, irregular, inclusions of purplish-brown glass (Pl. viii., fig. 4) and others hair-like crystals probably of rutile. There is no pressure granulation. Orthoclase and plagioclase are in about equal quantity and are from ·08 to ·03 in length. The hornblende is brown and strongly pleochroic ; sometimes twinned. Biotite

and apatite occur in small quantities, as well as a little chlorite. Forms a dyke on Mr. Henderson's farm, in rocks belonging to the Hokanui System.

Schistose Granite.

Lower Buller Gorge—Fine grained brownish-grey rocks, with the mica arranged, more or less regularly, into foliæ. S.G. 2·67 to 2·76. Section: quartz, orthoclase, plagioclase, biotite, muscovite. A large part of the quartz has been reduced to a fine pressure granulation and has flowed round the felspars which have retained their shape but have the angles rounded. The plagioclase is quite subordinate to the orthoclase. The mica is much bent.

ELVANITE GROUP.

(Quartz-felsite.)

Microgranitic compounds of quartz and orthoclase, usually with porphyritic crystals of quartz and often of orthoclase, mica, or hornblende in addition.

Quail Island, Lyttelton Harbour—A finely granular, non-porphyritic white rock, stained yellow-brown in places. Section: Granular, between microgranitic and microlitic, composed of felspar microlites and laths from ·006 to ·008 in length with quartz grains between them.

Occurs as dykes. A doubtful Elvanite. Haast, Geol. Cant. and Westland, p. 348 (Trachyte).

Mount William, near Westport—A pale grey rock consisting of porphyritic crystals of quartz, felspar, and biotite in a small groundmass. S.G. 2·56. It contains fragments of other rocks. Section: Ground-mass between microgranitic and microlitic formed by colourless anisotropic grains, about ·0006 in diameter, with low polarization colours, small fragments of biotite and specks of magnetite and pyrites in small quantity without any glassy base. The porphyritic minerals are quartz, orthoclase, plagioclase and biotite. The quartzes are corroded and contain gas cavities, but I saw none with liquid and bubble; the orthoclase has the same kind of gas cavities as the quartz. These crystals go to ·16 inch. Given me by Dr. Gaze. I do not know its geological position.

Lower Buller River—A blackish-grey, sub-vitreous rock with distinct grains of quartz and crystals of felspar in a large groundmass. S.G. 2·69. It contains fragments of other rocks. Section: Ground-mass abundant between microgranitic and microlitic, formed by colourless anisotropic grains from ·003 to ·001 in diameer and a few microlites of biotite in a small amount of glassy base. The porphyritic minerals are quartz, orthoclase, plagioclase and biotite, from ·06 to ·08 in diameter. Magnetite is in scattered

crystals and grains. Pyrite is rare. Apatite in the felspars and in the ground-mass.

Occurs as boulders in the Lower Buller at the ferry. Notwithstanding its different appearance, it is closely related to the Mt. William rock. It is a doubtful elvanite ; perhaps it is a rhyolite, but I have seen no rhyolite with a similar ground-mass.

Great Barrier Island—Dykes of elvanite with idiomorphic quartz are found cutting the slates and sandstones in Mine Bay, at north part of the island ; but I have no specimens for microscopic examination. Hutton, Reports Geol. Explorations, 1868-9, p. 3 ; Cat. Colonial Museum, 1870, p. 112.

RYOLITE GROUP.

Trachytic rocks composed of a semi-crystalline or vitreous ground-mass containing porphyritic minerals which are usually quartz* and sanidine with small quantity of some ferro-magnesian silicate. The name Rhyolite has priority of a year over Liparite.

Rhyolite.

No ferro-magnesian silicate. (a) With quartz.

Lake Taupo—A red trachytoid rock with abundant large crystals of sanidine and smaller quartzes. S.G. 2·40. Section : Ground-mass moderate in quantity and crystallitic, consisting of a colourless glass dense with hæmatite granules and colourless crystallites. The porphyritic minerals are quartz, sanidine and plagioclase, and scattered crystals of magnetite. The sanidine crystals go to ·3 inch. The plagioclase is subordinate to the sanidine. A fragment only, picked up on the north-east shore of Lake Taupo ; it may have come from Tauhara.

(b) Without quartz.

Lyttelton—A pale yellowish-grey vesicular rock with conspicuous white felspars. S.G. 2·44. Section : Ground-mass abundant, colourless, partly microlitic and partly crystallitic (longulitic) crowded with minute microlites of felspar, ·0025 and less, shewing fluxion, and a little magnetite. The porphyritic minerals are sanidine and plagioclase which go up to ·15 inch in length. There is a little zircon and secondary hæmatite and limonite. Tridymite is found in the vesicles. An analysis by Professor Bickekton gives 73·17 p.c. of silica. On the road from Lyttelton to Summer. Haast, Trans. N.Z. Inst., Vol. II., p. 503, and Geology of Canterbury and Westland, pp. 332 and 354; Kolenko, Neuer Jahrbuch fur Mineralogie &c., 1885, p. 8, (Trachyte).

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* This quartz when allotriomorphic is sometimes called 'blebs' by geologists. But 'bleb' means a small hollow bubble or blister; while these are solid.

Quail Island, Lyttelton Harbour—A pinkish-brown rock, much weathered to rusty-brown, not shewing porphyritic minerals. S.G. 2·54. Section: Ground-mass very abundant, crystallitic, longulitic, with minute specks of limonite, enclosing felspar microlites and laths up to ·03 in length. Porphyritic minerals are plagioclase and sanidine, the latter subordinate. Both go to about ·04 in length. Limonite has almost entirely replaced the magnetite.

Waitoa, Piako Co.—A pale yellowish-brown rock, much decomposed, containing fragments of pumice and conspicuous felspars. Section: Ground-mass moderate, brownish-yellow, crystallitic, pumiceous. The porphyritic minerals are sanidine and plagioclase, the latter subordinate. Sanidine crystals to ·08 in length. The iron oxide is ilmenite.

Waihi, Thames District—A yellowish-brown brecciated rock with crystals of felspar, containing fragments of pumice and of a compact pale brown rock. Section: Ground-mass colourless, crystallitic, pumiceous. The porphyritic minerals are plagioclase and sanidine, the latter subordinate. The felspar crystals go to ·04 in length. Possibly a little biotite is present. Cox, Reports Geol. Explorations, 1882, p. 20.

Biotite Rhyolite.

A. Crystallitic texture. (Liparite in part.)

Gebbie's Pass, Banks Peninsula—Quartz, felspar (chiefly sanidine) and biotite in an abundant ground mass, which is either felsitic or microgranitic, usually mixed, with one kind predominating. Haast, Geology of Canterbury and Westland, pp. 289 and 326. These rocks have been described by Dr. P. Kolenko in the 'Neuer Jahrbuch fur Mineralogie &c., 1885, Bd. I., p. 3; translated in the N.Z. Journal of Science, Vol. II., p. 550. I have made no microscopic examination myself.

Malvern Hills, Selwyn Co.—Compact grey, purple or green rocks, often mottled, with quartz grains plainly visible to the naked eye. S.G. 2·45 to 2·59. Section: Ground-mass abundant, crystallitic, enclosing minute short microlites of felspar. The colour of the rock is due to the crystallites. Usually with white specks of leucoxene, or kaolin, which in some cases occupy most of the ground-mass. The porphyritic minerals are quartz, sanidine, plagioclase, biotite and magnetite, but the last three are rare. Pink garnets are common in most specimens and occasionaly zircons. The quartz is either idiomorphic or allotriomorphic, while the sanidine is in square sections. Both contain large fluid inclusions and sometimes negative crystals with a fixed bubble. In size they go up to ·05 or rarely to ·08 inch. Mt. Misery, Snowy Peak, and Hororata.

Haast, Reports of Geol. Explorations 1870-1, p. 15; and Geology of Canterbury, p. 285; Hutton, Rep. Geol. Expl. 1872-3,

p. 40; Cox, Rep. Geol. Expl. 1883-4, p. 34. Analyses are given by W. Skey, Col. Museum and Lab. Report, No. 7, p. 17; and von Hauer in Geol. of Canterbury, p. 285 (Quartziferous porphyry). Microscopical examinations have been published by Daintree in Trans. N.Z. Inst., Vol. VII., p. 459 (Trachytic Rocks) and Cox, Rep. Geol. Expl. 1883-4, p. 107.

B. Vitreous texture. (Vitrophyre in part.)

Malvern Hills, Selwyn Co.—From dark brown and sub-vitreous to black and vitreous, with small glassy crystals, often of a yellowish colour, more or less abundant. S.G. 2·40 to 2·52. Section: Ground-mass very abundant, of clear glass, pale brown or colourless thickly studded with granules of magnetite. Some specimens go over into the crystallitic kinds. Fluxion structure is always plain and the ground-mass is banded with two differently coloured glasses. The porphyritic minerals are quartz and sanidine, with a little plagioclase and biotite, and are of the same sizes as those in the crystallitic kinds. Pale pink garnets are not uncommon even in the most vitreous varieties, but there are no distinct crystals or grains of magnetite.

Snowy Peak. References same as the crystallitic kinds, where they will be found described under the name of Pitchstones; a name which I limit to non-porphyritic rocks.

Mount Somers, Ashburton Co.—Black, vitreous, with small yellowish crystals thickly scattered: fracture perlitic in one direction, sub-conchoidal in others. S.G. 2·40. Section: Ground-mass very abundant formed by a brown glass rather closely studded with black globulites and margarites shewing fluxion, and containing a few scattered felspar microlites. Numerous perlitic cracks which are crossed by the margarites, and which are narrowly margined by clear brown glass. The porphyritic minerals are quartz, sanidine, plagioclase, and biotite. The quartz is idiomorphic or allotriomorphic about ·04 in diameter; the felspars go up to ·08. Plagioclase is subordinate to the sanidine. Biotite is rare, goes up to ·015 inch. Haast, Rep. Geol. Expl., 1873-4, p. 11.

Hornblende Rhyolite.

Lake Tarawera, Tauranga Co.—(1) Part white and part grey with distinct plane of division; the white portion more crystalline and shewing scattered crystals of hornblende and biotite in hexagonal plates; the grey portion more glassy. Section: Ground-mass micro-vesicular, pumiceous, although apparently compact to the naked eye. The porphritic minerals are quartz, sanidine and plagioclase, with a little hornblende, biotite, and enstatite. The quartzes go up to ·06. The plagioclase is subordinate to the sanidine, both reach a size of ·06. The hornblende does not exceed ·03, it is brown and strongly pleochroic. The biotite is very dark

and greenish. The enstatite is rare; one crystal, ·02 in length, pleochroic α and β pale yellow-brown, γ greenish-brown. Collected on the west side of the lake before the eruption of 1886.

(2) Highly vesicular, almost pumiceous, pale grey. Section: Ground-mass very abundant, partly vitreous and partly crystallitic and turbid: it contains many longulites and a few elongated vesicles, but is not microvesicular like the last. The porphyritic minerals are quartz, sanidine and plagioclase with a few small fragments (·02) of brown hornblende. The quartz goes to ·025; the sanidine to ·06; and the plagioclase to ·03. Magnetite is rather plentiful; Ilmenite occurs also. This specimen was thrown out of Mt. Tarawera during the eruption of 1886 and was picked up at Te Ariki, by the boat party on June 14th. It was very hot when collected, four days after the eruption, and was roughly rounded by attrition.

Lake Rotorua, Tauranga Co.—(a) Micro-vesicular variety.—A white granular looking rock, with quartz, felspar, and magnetite, but vesicular. Section: Ground-mass in small quantity, partly crystallitic and partly pumiceous. The elongated vesicles start from the porphyritic crystals and do not fold round them. In places the ground-mass has become opaque white (kaolinised?). The porpheritic minerals are quartz, plagioclase, sanidine, and magnetite with small quantities of greenish hornblende and biotite. The crystals are crowded and reach ·08 in length. The sanidine is subordinate to the plagioclase. From Mokoia Island. Fragments also occur, not uncommonly, in the cliffs of the lake at Te Ngae. It is the 'Nevadite' of Zirkel in the voyage of the Novara, Geol. Vol. I., p. 110.

(b) Spherulitic variety.—Grey, or pale brown, stony, often banded, and with scattered quartz crystals. Spherulites sometimes visible to the naked eye, sometimes invisible. S G. 2·30 to 2·32. Section, Ground-mass very abundant and generally banded lighter and darker; often irregularly stained with hæmatite or limonite: the lighter portions with their long axes in the direction of the coarser banding. With crossed nicols numerous incipient spherulites, about ·004 inch diameter, often appear; while in some there are true spherulites from ·06 to ·08 in diometer. The porphyritic minerals are quartz, sanidine, plagioclase and very dark hornblende. The plagioclase and sanidine are about equal in quantity, Occur as fragments in the cliffs at Te Ngae; they are very various in texture and cannot be described in a single paragraph.

Augite Rhyolite.

Ateamuri, E. Taupo Co.—Pale green rooks with fragments of white pumice, and scattered glassy crystals not very conspicuous to the naked eye. Section: Ground-mass partly crystallitic and

partly vitreous, the crystallites yellowish not uniformly distributed but gathered into irregular masses, sometimes as cumulites but more often with defined edges and transparent bands between the patches. Sometimes the base is pumiceous. In some places microlites are numerous, in others they are few and scattered. The porphyritic minerals are quartz, sanidine and plagioclase, with a little brown hornblende and pale green augite in small fragments. The plagioclase is subordinate to the sanidine. The felspar crystals go up to ·04 inch. Thomas, Report on the Eruption of Tarawera, p. 16.

Enstatite Rhyolite.

Lake Taupo—Black or dark grey rocks of different shades, often banded or damascened and sometimes with a sub-vitreous lustre, occasionally vesicular ; shewing usually scattered crystals of glassy felspar. S.G. 2·35 to 2·40. Section : Ground-mass very abundant partly crystallitic and partly microlitic ; the crystallitic portions globulitic and more or less opaque ; the microlitic portions more or less transparent. The two textures are variously arranged, sometimes in layers, but usually the more opaque portions form clouds through the microlitic portion, not sharply defined but shading one into the other. Sometimes the layers are very distinct and parallel forming the Lithoidite of Hochstetter. The felspar microlites are about ·005 in length. There is no distinct fluxion structure. The porphyritic minerals are principally sanidine and enstatite, there is also some plagioclase and magnetite in small crystals, and perhaps a little augite. I found no quartz. The felspar crystals are from ·03 to ·08 in length. The enstatite is in prisms about ·04 to ·08 in length, and ·01 to·04 in thickness, rarely the length goes to ·15. It is rather strongly pleochroic, a and β reddish-brown when thick, yellowish when thin, and γ greenish-blue ; probably therefore it is hypersthene.

These rocks occur commonly round the shores of Lake Taupo. The variety called Lithoidite is recorded from Hamaria on the eastern side of the lake by Dr. v. Hochstetter, and from the island of Motukaiko by Professor Thomas. It is the most remarkable example of banding in a volcanic rock that I have ever seen. Hochstetter, New Zealand, p. 385 ; Thomas, Trans. N.Z. Inst., Vol. xx., p. 309 ; Pond, Trans. N.Z. Inst., Vol. xxi., p. 349, analyses Nos. 7 and 8.

The pumice so abundant around Lake Taupo is no doubt derived from these rocks. It contains crystals of sanidine (often mistaken for quartz) and hypersthene, by which it can be recognised wherever it is found. The sand on the shore of Lake Taupo contains crystals of hypersthene abundantly. It is the Protohypersthene of Professor Judd.

Chloritic Rhyolite.

Okaro, Lake Tarawera—Opaque white or pale greenish-grey rocks with an earthy fracture. Section: Ground-mass very abundant, consisting of a colourless or pale yellowish-brown glass with innumerable crystallites, and chloritic infiltrations. The porphyritic minerals are quartz and sanidine with some plagioclase, hornblende and biotite. Pseudomorps of chlorite after hornblende and biotite. Pyrite occurs in all, sometimes in great abundance. Hutton, Quart. Journ. Geol. Soc. of London, Vol. xliii., p. 184.

These rocks were thrown out from the Okaro craters during the eruption in 1886. They exhibit very interesting examples of alterations remarkably like the changes that have taken place in the auriferous rocks at the Thames. At Okaro the rocks are rhyolites, while at the Thames they are andesites, but in both cases the ferro-magnesian silicates have been changed into chlorite and pyrites has been produced. At Okaro these changes must have taken place near the surface.

Thames District—A compact pale grey rock. S.G. 2·62. Section: Felsitic, shewing a mosaic, and containing small angular fragments of quartz and crystals of pyrites scattered abundantly throughout. The quartz contains occasionally small glass inclusions with a fixed bubble, generally it has only clouds and sheets of minute gas pores. There are also patches of a colourless, irregularly fibrous, mineral with aggregate polarization and rather brilliant colours, and occasionally with greenish inclusions. Calcite occurs in grains in the ground-mass and occasionally in larger masses which were probably once felspars.

Occurs in numerous branching veins on the beach below high-water mark, a little south of Waiohanga Creek. It appears to be a Chlorite Rhyolite from which most of the chlorite has been removed.

OBSIDIAN GROUP.

Amorphous rocks, crystallitic, vitreous, or felsitic: porphyritic minerals absent, or few and small. Silica more than 60 per cent.

Palla.

Lithoid or stony obsidian with crystallitic texture.

Gawler Downs, Ashburton Co.—Compact rocks of various colours red, purple, pale green, or grey, often mottled, and with sub-conchoidal fracture. S.G. 2·23 to 2·35 Section: Crystallitic, longulitic, with scattered felspar microlites, sometimes shewing fluxion, and often with opaque white specks of leucoxene or kaolin.

These rocks are identical with the ground-mass of the stony rhyolites, or liparites. The late Sir Julius von Haast told me that he had sent specimens to Vienna many years ago, and that they

had been named Palla by the officers of the Geological Survey of Austria. Hector, Catalogue of the Colonial Museum, Wellington, 1870, p. 159, Nos. 19 and 20. Cox, Reports Geol. Expl. 1876-7, p. 3, and 1883, p. 40.

Pitchstone.

Vitreous or sub-vitreous rocks with a more or less splintery fracture, and containing from two to eight per cent. of water.

Maketu, Tauranga Co.—A dark brown, sub-vitreous rock, containing fragments of other rocks. Section: vitreous, damascened brown and white, shewing fluxion, and containing minute fragments of sanidine.

Mayor Island—A reddish-brown compact rock, marbled with yellowish- and greenish-brown; lustre resinous. Section: Microvesicular, pumiceous, with abundant felspar microlites shewing fluxion. The vesicles are elongated and pass into trichites. (Plate viii., fig. 2.)

Spherulitic Pitchstone.

Rotorua, Tauranga Co.—Black, lustre vitreous, containing grey spherulites, often pink on the outside, up to ·15 inch in diameter. Section: Vitreous, with scattered belonites shewing fluxion, elongated vesicles and trichites, in places almost pumiceous. Most of the trichites are straight, but others are curved or radiating from a centre which is often plainly a vesicle (Plate viii., fig. 3); sometimes starting from a belonite; some have rows of granules (?) attached to one side. This rock plainly shews trichites to be elongated vesicles. There are also crystallites in the form of globulites. Also a few very small crystals of quartz, sanidine, and plagioclase so that the rock passes in places into a rhyolite. The spherulites all shew radiating structure and are brownish by transmitted and white by reflected light. They are very opaque but the small ones are translucent on their margins, and there the interference cross is seen to be parallel to the nicol sections. Usually, perhaps always, a small quartz crystal forms a centre from which, by reflected light, small black margarites are seen radiating outwards on the white general mass. The sperulites were formed after fluxion movement had ceased. Perlitic cracks are rare; there are none round the spherulites. Hemo Gorge, Rotorua. Hochstetter, New Zealand, p. 421; Thomas, Report on Eruption of Tarawera, Wellington 1888, p. 16.

Obsidian.

Vitreous rocks with conchoidal fracture, and containing less than one per cent. of water.

Mayor Island—Black. S.G. 2·35. Section: A nearly colourless glass with abundance of scattered crystallites and some microlites

of felspar and hornblende, shewing fluxion. There are no trichites nor microvesicles. The hornblende microlites are long narrow prisms of green colour which extinguish at angles up to 20° with their length.

This obsidian was in common use by the Maories, and no doubt the analysis of an obsidian from the Bay of Islands, given in Phillips' Mineralogy, by Brook and Miller, refers to it. Silica 75·20, alumina 6·86, red ox. of iron 6·54, lime and magnesia 3·83, soda and potash 7·57 ; S.G. 2·386.

Taupo District—Black. S.G. 2·37. Section : A homogeneous pale glass with a few small felspar microlites, not shewing fluxion, and rarely small crystals of biotite. Vitreous with crystallites, chiefly longulites, gathered together into long thin, distant, parallel bands ; so closely are they crowded that the texture almost becomes crystallitic. The rest of the glass is remarkably free from crystallites, but occasionally they occur in patches not so densely crowded as in the bands. Shore of Lake Taupo, fragments only. Professor Thomas has described a similar obsidian obtained by Mr. Cussen from Ngaruahoe, and probably my specimens have the same origin. Thomas, Trans. N.Z. Institute, Vol. xx., p. 311.

Lake Rotoiti, Tauranga Co.—A black vitreous volcanic bomb, highly vesicular inside, and with a thin cracked vitreous skin on the outside. Section of interior portion : clear glass with abundant margarites and longulites, straight or curved, generally lying parallel and shewing fluxion, but in places confused ; containing occasionally microlites, or small fragments of crystals of felspar. From Mt. Haroharo.

Felsite.

Devitrified obsidians and pitchstones, with felsitic texture.

Mataura District, Southland—Variously coloured, compact, hard rocks, pink, white, grey, green ; sometimes banded or damascened, sometimes spherulitic. S.G. 2·50 to 2·54. Section : Felsitic texture, some shew a mosaic either large and irregular or minute, others shew no mosaic. Some have dark markings resembling perlitic cracks. Veins and infiltrations of chalcedony

Spherulitic Felsite.

Light grey rocks with spherulites up to a quarter of an inch in diameter. With crossed nicols shews a very fine mosaic. The spherulites have an opaque white centre surrounded by a broad dark brownish-grey ring and without an outer transparent zone. Another specimen has numerous small spherulites without any ring and shewing an interference cross, in a ground-mass which shews occasionally a large mosaic. Occur as pebbles at Waipapa Point, near the mouth of the Mataura River. Hutton, Trans. N. Z. Institute, Vol. xx., p. 269 (Rhyolite).

SODA-POTASH SERIES.

Silica 65 to 55 per cent.: iron oxides $2\frac{1}{2}$ to 8 per cent. The lime and magnesia together are more than half the alkalies, and more than one-fifth of the alumina. Soda usually equal to or rather more than the lime. Potash attains its maximum of 5 to 7 per cent. Quartz is often present in the holocrystalline rocks but in the semi-crystalline rocks it is absorbed into the base. S.G. 2·6 to 2·9.

SYENITE GROUP.

Granitic compounds of orthoclase and hornblende or biotite, sometimes with augite. Quartz and plagioclase are usually present in subordinate quantity, but sometimes the plagioclase may exceed the orthoclase.

Muscovite Syenite.

Preservation Inlet—A fine to coarse grained rock, white or pale pink, with small muscovites scattered or in clusters. S.G. 2·64 – 2·62. Section: Quartz, orthoclase, plagioclase and muscovite. The quartz is in small grains, from ·01 to ·04 in diameter, the last not common, but shews no pressure granulation; the larger grains contain fine acicular, transparent, crystals. Orthoclase and plagioclase are about equally abundant, and are from ·02 to ·07 in length. Pink garnets, about ·015 in diameter are common. Occurs on the periphery of the pink syenite found in Preservation Inlet. An analysis by Professor Liversidge gave 65 per cent. of silica; (Trans. N.Z. Institute, Vol. x., p. 505) so it might equally well be put into the Granite Group.

Hornblende Syenite.

Preservation Inlet, Fiord Co.—A coarse grained pink rock. The felspar partly pink and partly white, forms the bulk of the rock, with chlorite and hornblende in greenish black crystals, smaller than the felspars, scattered tolerably evenly. Quartz in small quantity. S.G. 2·635. Section: The Quartzes do not exceed ·1 inch in diameter while the felspars are much larger. The latter are much decomposed, but I recognised plagioclase in the red and orthoclase in the white felspar. The last, which is the least decomposed, has numerous gas-pores in bands, principally in two directions. The pink felspar is more abundant than the white, and is colóured by hæmatite granules. Cleavage flakes of the hornblende are slightly pleochroic,, changing from bluish-green to brownish-green or yellowish-green; with convergent polarised light they shew a distorted optic axis and axial shadow. Most of the hornblende however is altered to a green or brown chloritic mineral, cleavage flakes of which are isotropic and shew no interference figure. Hutton. Geology of Otago, Dunedin, 1875, p. 40 (Granite).

Wet-jacket Arm, Fiord Co.—A coarsely crystalline rock composed of white felspar and long prisms of hornblende up to an inch in length and a quarter of an inch in breadth; the two minerals in nearly equal quantity. S.G. 2·95. Section: The felspar is orthoclase in groups of independently oriented crystals from ·04 to ·10 in diameter. The hornblende is brown, strongly pleochroic. There is a little quartz, not visible to the naked eye. Perhaps from a segregation vein and not a true rock.

Westport—A fine grained greenish-grey rock, the separate crystals hardly visible to the naked eye. S.G. 2·768. Section: Composed of felspar and hornblende with abundant apatite. Secondary minerals are chlorite, epidote, pyrites, and magnetite. The felspars are much decomposed and can only occasionally be made out; they appear to be principally orthoclase with a little plagioclase. They are broad in section and from ·02 to ·08 in length. The hornblende rarely exceeds ·04; it is brownish-green in ordinary light, and pleochroic changing from dark blue-green to yellow-brown. The chlorite is blue-green, not pleochroic, and partly isotropic. The epidote is the usual colour, and occurs in veins and in the hornblendes: it is not pleochroic. Occurs near the sea-shore, 16¾ miles north of Westport.

Mackay's Bluff, Nelson—A fine grained granular rock, greyish-green in colour and often containing veins of epidote. S.G. 2·86. Section; Composed of felspar, quartz, and hornblende, with magnetite in considerable quantity; there is a little apatite in the quartzes, and occasionally some biotite. Secondary minerals are chlorite, epidote in bands and patches, limonite in small irregular flecks, and magnetite after hornblende. Much of the quartz is also secondary. The quartz is in grains up to ·02 in diameter, with minute gas pores not arranged in bands but scattered with tolerable uniformity throughout. The felspars are much altered and often impossible to determine, but some are orthoclase and some plagioclase: they are from ·03 to ·12 in length. The hornblende is not more than ·03 in length; it is allotriomorphic and not much cleaved, green in colour and strongly pleochroic; most of it is altered into a bluish-green pleochroic chlorite. Hochstetter, New Zealand, p. 471.

Akaroa, Bank's Peninsula—A rather fine grained pale browish rock, partly decomposed. Section: Composed of orthoclase, plagioclase, and hornblende with some quartz and magnetite. Secondary minerals are reddish-brown opacite round the magnetites and in the hornblendes, probably a mixture of hæmatite and limonite. The quartz is from ·01 to ·03 in diameter and fills up interstices between the felspars. The felspars are from ·03 to ·15 in length. The hornblende goes up to ·05 in length; when fresh it is greenish and pleochroic, changing from blue-green to yellow-

green, the polarization colours not brilliant. There is also, very rarely, a colourless mineral in hexagonal prisms which appears to be either apatite or nepheline. Forms a hill at the south end of peninsula in Akaroa Harbour. Haast, Geol. of Canterbury, p. 344, (Granitoid Trachyte).

Augite Syenite (Monzonite).

Tekoa, Amuri Co.—A fine grained, pale, pinkish-brown rock with black prisms of augite. Section: composed of orthoclase, plagioclase, augite, and a little hornblende. There is no quartz. The felspars average ·10 inch: the orthoclase is subordinate to the plagioclase. The augites go up to ·03 in length; they are green and mostly altered. The hornblendes go to ·08 in length, and are brown or green, sometimes actinolitic and probably secondary after augite. Magnetite and hæmatite are accessories. From a spur of Hurinui Peak, running to the Mandamus River. Haast, Rep. Geol. Explorations 1870-1, pp. 30 and 46, Section 17 (Diorite); also Geol. of Canterbury, p. 285. Hutton, Rep. Geol. Explorations 1872-3, p. 34.

ORTHOPHYRE GROUP.

(Felsite in part.)

Microgranitic compounds of orthoclase with some plagioclase, hornblende or biotite, and often quartz. Sometimes with porphyritic crystals of felspar, hornblende, or biotite. None as yet described from New Zealand.

TRACHYTE GROUP.

Trachytic rocks composed of a semicrystalline ground-mass with felspar microlites, containing porphyritic crystals of sanidine, and usually plagioclase, with hornblende or mica, or occasionaly augite or enstatite.

Hornblende Trachyte.

Lyttelton—Greenish-grey rocks with glistening lustre, often vesicular, and containing a few porphyritic crystals of felspar and long, narrow, prisms of hornblende. S.G. about 2·44. Section: The ground-mass is very abundant, microlitic, with felspar microlites and plates from ·008 to ·01 in breadth, with granules of magnetite and infiltrations of chlorite. Fluxion structure is evident. The porphyritic minerals are sanidine, plagioclase, and hornblende. The sanidine is in carlsbads or rectangular and up to ·12 in length. The plagioclase goes up to ·04 in length, sometimes subordinate to, sometimes predominant over the sanidine. The hornblende is not abundant, but in addition to the porphyritic crystals there are some microlites in the felspars. There is a little apatite. Forms dykes on the Lyttelton and Sumner Road. Haast,

Trans. N.Z. Inst., Vol. XI., p. 503, and Geology of Canterbury, p. 337.

Sugar Loaves, Taranaki—A pale grey, vesicular rock, with abundance of sanidine crystals and small black prisms of hornblende. Section: The ground-mass moderate, crystallitic, longulitic, but with numerous felspar microlites from ·001 to ·002 in length, the glass is colourless. The porphyritic minerals are sanidine, plagioclase, hornblende and magnetite. The felspars go to ·25 in length, they are zoned and with inclosures either central or zonal; the plagioclase is subordinate to the sanidine. The hornblende is brown and goes up to ·15 inch in length. Hector, Progress Report Geol. Survey, 1866-7, p. 3.

This is the rock of which the pier at Taranaki harbour is formed. It occurs as a dyke cutting trachytic agglomerate. It sometimes contains masses of nearly pure hornblende six or eight inches in diameter.

Whangarei—A pale purplish-white rock with rather earthy fracture, and with numerous small black specks scattered through it. Section: Ground-mass abundant, colourless, and crystallitic, but crowded with felspar microlites about ·002 in length, and containing small crystals of brown hornblende. The porphyritic minerals are sanidine (·02), plagioclase (·015), hornblende (·06), and a little biotite. There is no magnetite. The hornblendes are brown, more abundant than the felspars, and shade off into the hornblendes of the ground-mass. Brownish chlorite occurs after hornblende. Occurs at Mt. Parahaki, a little east of Whangarei. Cox, Reports Geol. Expl. 1876-7, p. 99.

Augite Trachyte.

Bank's Peninsula—(1.) A darkish-grey compact rock with scattered crystals of sanidine up to ·25 in length. S.G. 2·53. Section: Ground-mass very abundant, vitreous, crowded with felspar microlites in laths and plates from ·005 to ·01 in length, a few green augite microlites and specks of iron oxide. Shewing fluxion. The porphyritic minerals are sanidine, augite and a little magnetite. The sanidine is in long carlsbad twins. The augite is green and with low polarization colours, scarce, up to ·015 in length. Forms a prominent dyke on the top of the hill on the west side of Heathcote Valley. Dobson, Trans. N.Z. Inst., Vol. XIII., p. 391.

2. A greenish-grey rock with glimmering lustre and containing large white felspars. Section: Ground-mass very abundant, microlitic, shewing fluxion, formed by plates and microlites of plagioclase up to ·02 in length, with scattered augite prisms ·01 in length and some chlorite. Porphyritic minerals are sanidine (?) and augite. The felspar is in carlsbads which extinguish nearly but not quite

simultaneously, or in square sections which extinguish at angles up to 8° with the cleavage. The augite is dark green and up to ·02 in length. From a dyke on the bridle track between Heathcote and Lyttelton on the Lyttelton side. I doubt its being a true trachyte, but it is probably the same rock as that which Dr. Kolenko has described as a trachyte from the tunnel in which the ground-mass is composed of nearly equal parts of felspar microlites and augite prisms. (N.Z. Journal of Science, Vol. II., p. 552). In my specimen the augite of the ground-mass is quite subordinate to the felspar.

3 Pale grey rocks with scattered black augites and a few felspars Section : Ground-mass very abundant, microlitic, formed of felspar microlites, ·005 in length, and augite prisms, ·001 to ·002 in length, with some magnetite dust ; the augite quite subordinate to the felspar. The porphyritic minerals are sanidine, plagioclase and augite. The plagioclase is well twinned, the sanidine in binary twins up to ·08 in length, The augite is pale green, rare, up to ·02 in length. There is sometimes a little chlorite. Forms dykes on the road between Heathcote and Sumner. The sanidine is doubtfully identified.

Enstatite Trachyte.

Runanga, E. Taupo Co.—A pale grey rock with abundance of brown spots of enstatite surrounded by a wreath of iron oxide, and of colourless felspars. Fracture earthy. Section : Ground-mass very abundant, colourless, crystallitic, longulitic, with scattered felspar microlites ·004 in length, shewing fluxion. The porphyritic minerals are sanidine and plagioclase in about equal quantity, enstatite and small quantities of augite and hornblende, with magnetite in crystals and grains. The felspar crystals are about ·04 in length. The enstatite is in prisms, ·03 in length ; pleochroic, α and β pale yellowish-brown, γ pale bluish-green. The augite is pale green and the hornblende brown. Both are in small crystals not more than ·02 in length. This rock covers a considerable area between Runanga and Tarawera on the Napier Road. Hector, Rep. Geol. Expl. 1870-1, p. 160.

Division II.—PLAGIOCLASE ROCKS.

Plagioclase (excluding microcline) is always present, orthoclase is absent or rare. Hornblende or augite, or both, generally accompany the plagioclase. Biotite, enstatite, or olivine may or may not be present. The soda exceeds the potash.

LIME-SODA SERIES.

Silica 65 to 55 per cent. Iron oxides 6 to 13 per cent. The lime and magnesia together are more than the alkalies. The lime alone is less than one-half of the alumina and more than the soda.

The ferro-magnesian silicates are subordinate to the felspars which are usually oligoclase to labradorite. Soda attains its maximum of 3 to 5 per cent. Quartz is often present in the holocrystalline rocks, but in the semicrystalline rocks it is usually absorbed into the base. S.G. 2·55 to 2·85.

DIORITE GROUP.

Granitic compounds of plagioclase with biotite, hornblende, augite, or enstatite, sometimes with a little quartz. The plagioclase is either in broad plates or in broad laths.

Biotite Diorite.

Lower Buller Gorge.—A medium grained dark grey rock shewing white triclinic felspar and quartz with abundance of biotite and hornblende. S.G. 2·89. Section: Quartz is tolerably abundant in allotriomorphic crystals from ·01 to ·06 in diameter, and contains rather large fluid cavities. The felspars are broad, the length about twice the breadth, and are well twinned; they are from ·02 to ·07 in length. The hornblende is brown, chiefly allotriomorphic and up to ·05 in length. Biotite is more abundant than hornblende and in crystals up to ·08 in diameter. There is a little apatite and blue-green chlorite. Occurs as a dyke in granite, close to the bridge over the Ohika Creek.

Hornblende Diorite.

Upper Buller District—Medium grained, black and white speckled rocks, composed of white felspar and black hornblende. S.G. 2·81 to 2·9. Section: The felspars are much altered, but polysynthetic twinning is sometimes plain in rather broad bands; the crystals from ·02 to ·08 in length. The hornblende is chiefly allotriomorphic, from ·025 to ·08 in length. In ordinary light it is yellowish-green, but is pleochroic changing from pale yellow-green to deep bluish-green. There is also some magnetite. Secondary minerals are quartz and chlorite. In some specimens there is very little felspar, and that is in allotriomorphic grains.

Schistose Variety.

In this specimen foliation is evident. S.G. 2·87. Section: The hornblende is green, usually in irregular grains, but sometimes in prisms lying in the plane schistosity. The felspar is in broken grains which shew brilliant polarization colours like quartz, but the grains are sometimes cleaved, often partly decomposed, and occasionally shew polysynthetic twinning. Known only as boulders in the river gravels.

Enstatite Diorite.

Bluff Hill, Southland—A fine to medium grained, granular rock, speckled black and white, in nearly equal parts. S.G. 2·88.

Section: Composed of plagioclase, hornblende, enstatite and magnetite. The plagioclase is in small crystals, from ·025 to ·05 in length, and well twinned. It forms more than half the rock. The hornblende is allotriomorphic, green, slightly pleochroic changing from yellow-green to brown-green; go up to about ·06 or ·10 in length. Polarization colours not so bright as in the enstatite. The enstatite is allotriomorphic, and forms intergrowths with the hornblende. Yellow-green in ordinary light, pleochroic, changing from red to bluish-green. Polarization colours very brilliant; subordinate to the hornblende. The magnetite is not abundant, it is in masses or in crystals. Hutton, Geology of Otago, p. 41 (Syenite); Hamilton, Trans. N.Z. Inst., Vol. xix., p. 452; Park, Rept. Geol. Expl. 1887-8, p. 72.

Augite Diorite.

Mt. Charles, near Herbert, Otago—A rather coarsely grained light grey rock, composed of plagioclase, augite and titaniferous iron which is largely decomposed to leucoxene. S.G. 2·73. Section: Texture ophitic in places. The felspar is chiefly in broad laths from ·02 × ·015 to ·07 × ·03, but occasionally in square plates. The augite is in crystals from ·02 to ·04 in length, of a pale brownish-yellow colour. Secondary minerals are leucoxene and a little pyrites. Hutton, Geology of Otago (Oamaru formation) p. 56; McKay, Reports Geol. Explorations, 1876-7, p. 65.

PORPHYRITE GROUP.

Micro-granitic compounds of plagioclase with biotite, hornblende augite or enstatite, sometimes with olivine. Often with porphyritic crystals of minerals similar to those forming the ground-mass.

Hornblende Porphyrite.

Bluff Hill, Southland—A dark greenish-grey, compact rock, with crystals of black hornblende. S.G. 2·20. Section: Ground-mass abundant, micrographitic, formed of felspar grains, hornblende and chlorite, the crystals ranging between ·003 and ·007 in length rarely larger. The porphyritic minerals are hornblende and plagioclase. The felspars go up to ·06 in length and are much altered, but plagioclase is generally recognisable. The hornblende is partly idiomorphic and goes up to ·06 in diameter, it is of a brown colour. There is also some magnetite. Chlorite is abundant and there is a little pyrites. From Greenhills, with green volcanic sandstones or tuffs. Park, Reports Geol. Explorations, 1887-8, p. 73.

Coromandel, Hauraki District—A black rock with semi-vitreous lustre containing small greenish-white felspars. S.G. 2·65. Section: Ground-mass rather small, micrographitic, made up of small felspar laths and plates, from ·001 to ·006 in length, obscured

by a brown decomposition product. The porphyritic minerals are plagioclase and hornblende. The plagioclase crystals are from ·02 to ·04 in length, strongly zoned with negative crystals, and are not much decomposed. The hornblende is scarce and is mostly decomposed into an opacite, sometimes with chlorite; it is brown and the angle $c : \gamma = 12°$. Magnetite is in rather large grains decomposing into limonite. From the island in Omaru Bay. Hector, Rept. Geol. Explorations, 1870-1, p. 97, diagram iv.

Augite Porphyrite.

Enfield near Oamaru—Dark grey or blackish compact rocks, decomposing reddish-brown with white spots. S.G. 2·64 to 2·67. Section: Granular, composed of plagioclase, augite and ilmenite, with perhaps a little base. The plagioclase is in laths, from ·01 to ·04 in length. The augite is in grains about ·002 to ·003 in diameter, partly gregaritic and semi-ophitic. Secondary minerals are leucoxene, hæmatite and sometimes a little chlorite. Hutton, Trans. N.Z. Inst., Vol. xix., p. 419.

Harts Coal Mine, Malvern Hills, Selwyn Co.—A greenish-black compact rock, decomposing reddish-brown. S.G. 2·71. Section: Granular; composed of plagioclase augite and ilmenite. The plagioclase is in laths ·01 to ·02 in length. The augite is in grains ·004 to ·01 in diameter. Secondary minerals are brownish-green chlorite, a colourless aggregate with brilliant polarization colours, leucoxene and white pyrites. Haast, Reports Geol. Explorations, 1883-4, p. 17.

Olivine Porphyrite.

Moeraki Peninsula, Otago—A dark grey, rather coarse grained rock. S.G. 2·77. Section: Microgranitic; composed of plagioclase, augite, olivine, and ilmenite. The plagioclase is usually between ·01 and ·02 in length, rarely ·08. The augite is brownish-yellow, not abundant, granulitic, or glomero-porphyritic in places; the grains about ·01 in diameter. Olivine is rare. Leucoxene occurs commonly. Hutton, Geology of Otago, p. 61, and Trans. N.Z. Institute, Vol. xix., p. 428: McKay, Reports Geol. Explorations, 1886-7, p. 839.

Chloritic Porphryite.

Reefton, Inangahua Co.—A soft greenish-grey, compact rock, with dark green, almost black, shining patches of chlorite. S.G. 2·73. Section: Microgranitic, composed chiefly of plagioclase laths, from ·02 to ·04 in length, and chlorite. Other secondary minerals are calcite, leucoxene (?) and pyrites. The plagioclase is much decomposed. The chlorite is bright green and feebly pleochroic; it sometimes forms pseudomorphs after augite, but usually it is in irregular masses. From Specimen Hill Mine at Boatmans.

Thames District—1. A dark greenish-black compact rock with small black prisms scattered sparingly through it. S.G. 2·69. Section: Ground-mass moderate, microgranitic, of felspar plates and laths, from ·002 to ·006 in length, and chloritic infiltrations. Porphyritic minerals are plagioclase, serpentine and chlorite. The plagioclase crystals go up to ·04, zoned, partly decomposed. The serpentine is brownish-green, in small prisms, striated, not pleochroic. The chlorite is yellow-green, slightly pleochroic, and contains inclusions of apatite. Magnetite is in fine specks but is not abundant. Pyrites, also in fine specks, is less in quantity than the magnetite. Forms a dyke-like mass near the mouth of Tararu Creek. Hutton, Rept. Geol. Expl. 1868-9, p. 21 (Melaphyre); Hector, ditto, p. 40, No. viii. (Analysis).

2. Greenish-grey rocks with large white crystals of felspar and occasionally black prisms. S.G. about 2·66. Section: Ground-mass abundant, microgranitic, felspar plates from ·003 to ·006. Porphyritic minerals are plagioclase and chlorite with opacite after hornblende. The plagioclase is much decomposed, and up to ·20 in length. The hornblende crystals have been up to ·40 in length. The chlorite is green, sometimes pleochroic, changing from yellow-brown to dark bluish-green, and with very low polarization colours. Pyrite is common. Found as boulders on the beach north of Waiohanga Point.

ANDESITE GROUP.

Trachytic rocks composed of a semi-crystalline ground-mass with microlites of felspar, containing porphyritic crystals of plagioclase, (rarely with sanidine) and augite, often with hornblende or enstatite and occasionally with olivine in addition.

Hornblende Andesite.—(a) With quartz.

(Dacite.)

Thames District.—Greyish-green rocks with translucent colourless felspars and black prisms of hornblende thickly scattered through them. S.G. 2·62 to 2·76. Section: Ground-mass moderate, colourless, chiefly crystallitic but occasionally felsitic, with scattered felspar microlites and grains of magnetite. The porphyritic minerals are quartz, plagioclase and hornblende. The quartz is in small quantity, in allotriomorphic grains, from ·02 to ·07 in diameter, rarely more than one on a slide. The plagioclase goes to ·08; it is idiomorphic, zoned, and occasionally shews binary twins. The hornblende is brown, rather pale, idiomorphic, up to ·04 in length. Secondary minerals are chlorite, calcite, pyrites, and leucoxene. Hutton, Reports Geol. Explorations, 1868-9, p. 21 (Timazite); Hector, ditto, p. 40, Nos. x. and xi. (Analyses).

(b) Without quartz.

Dunedin—A dark grey rock with large crystals of hornblende, up to ·80 × ·14, and in places speckled with white. S.G. 2·825. Section: Ground-mass small, microlitic, including small kaolinised felspars, chlorite, numerous small grains of magnetite, and a little hæmatite. The porphyritic minerals are felspar, hornblende magnetite and apatite. The felspar is chiefly well twinned plagioclase in crystals up to ·15 in length, but there is also a simple felspar which may, perhaps, be sanidine. The hornblende is idiomorphic, brown, and usually with a wreath of magnetite; it goes to ·12 in length usually although larger crystals occur. Magnetite is in large grains and crystals. The apatite is the most interesting mineral. It is in prisms usually imperfect, but sometimes shewing pyramidal terminations (Plate viii., fig. 5), sometimes short but usually long, the length eight times the breadth. The length is from ·025 to ·065 and the breadth from ·005 to ·008. They shew distant, but perfect, basal cleavage cracks, and are longitudinally striated by enclosures which form bands radiating from the chief axis and unequally developed. Each of these radiating bands is formed by small black bacillar inclusions, placed parallel and with their long axis at right angles to the chief axis of the crystal. The prisms are colourless except where the inclosures are very numerous, here they are dark and distinctly dichroic, E > O. When the nicols are parallel and the axis of the crystal is placed at an angle of 45° with them the crystals become a purplish-brown colour. Apatite in the usual needle-shaped crystals is also distributed through the rock. There is also a little augite. A white secondary mineral fills cavities.

Bank's Peninsula—A brownish-grey rock with large white rectangular crystals of decomposing felspar and black hornblende. Section: ground-mass abundant, coarsely microlitic, made up of felspar laths and plates from ·01 to ·02 in length with a little brown glass and grains of magnetite. Shews fluxion. The porphyritic minerals are plagioclase, augite, and hornblende. The felspars are much decomposed and go to ·25 in length. The augite is idiomorphic, more abundant than the hornblende, the crystals going up to ·07 in length and ·04 in breadth, some are slightly pleochroic. The hornblende is brown, and goes up to ·20 in length. Forms a dyke at the summit of Evan's Pass, between Sumner and Lyttelton. Haast, Trans. N.Z. Inst., Vol. xi., p. 502, and Geology of Cant. p. 335.

Sugarloaves, Taranaki.—A pale grey rock with small black hornblendes scattered sparingly, occasionally in clusters. Section: Ground-mass in small quantity, crystallitic, longulitic, the base colourless, with scattered microlites of felspar and some of augite. No fluxion. The porphyritic minerals are plagioclase, hornblende,

augite, and magnetite. There is also a little secondary hæmatite. The plagioclase crystals go up to ·04 in length, they are zoned and often in binary twins. The hornblende is brown, up to ·08 in length. The augite is greenish, up to ·045. It is subordinate to the hornblende.

Mt. Egmont, Taranaki.—Greyish-brown to red rocks with scattered black hornblendes, and white felspars scattered or crowded. Section : Ground-mass crystallitic, either moderate or small in quantity, globulitic, a colourless glass generally dense with granules of magnetite or of hæmatite, and containing scattered microlites of felspar and occasionally of augite. No fluxion. The porphyritic minerals are plagioclase, augite, hornblende and magnetite. The plagioclase crystals are small, not more than ·02 in some specimens, but usually they go up to ·08 ; inclusions are abundant, central or zonal. The augite is pale yellowish-green, idiomorphic, the crystals large, from ·04 to ·08 in length. The hornblende is brown, idiomorphic, usually with a wreath of magnetite ; it is less in quantity than the augite, but occasionally the crystals are ·15 × ·04, usually they are much smaller. From both the north and south slopes of the mountain.

Mt. Ruapehu—A pale grey rock with scattered black hornblendes and white felspars. Much resembles the H. Andesite from the Sugarloaves. Section : Ground-mass abundant, crystallitic, longulitic, colourless, with specks of magnetite. No fluxion. The porphyritic minerals are felspar, hornblende, augite, enstatite, and magnetite. There is a little secondary hæmatite. The felspars are chiefly plagioclase, in crystals up to ·08 × ·06, but I saw a single rectangular simple crystal which gave straight extinction and may be sanidine. The hornblende is in long black prisms, ·07 × ·016. The augite is not common ; it is in small green crystals about ·01 in length. The enstatite is in crystals up to ·08 in length, changing from reddish-brown to bluish-green, and is therefore hypersthene. It is quite subordinate to the hornblende. From the east base of the mountain.

Coromandel, Thames District—A pale grey, compact rock, with scattered black hornblendes and white felspars. Much like the H. Andesite from the Sugarloaves. S.G. 2·45. Section : Ground-mass crystallitic, longulitic, abundant, containing scattered felspar microlites and laths, with magnetite in rather large grains. The porphyritic minerals are plagioclase, hornblende, and magnetite. The plagioclase goes up to ·10 in length, some crystals are decomposed in the centre, a few shew binary twins. The hornblende is brown and goes up to ·06 ; sometimes it is altered into calcite with a black border. Another specimen is darker in colour. S. G. 2·67. It contains, in addition to the hornblende some yellowish-green augite, up to ·06 in length, and often twinned.

Tokatoka, Kaipara.—A grey, compact, sub-vitreous rock, with small scattered hornblendes. S.G. 2·67. Section: Ground-mass abundant, microlitic, the microlites ·003 to ·007 in length with some magnetite grains. Probably there is no base, but a greenish-brown decomposition product makes observation difficult. The porphyritic minerals are plagioclase, hornblende, and magnetite. There is a little secondary quartz. The felspars go to ·04. The hornblendes are brown, with a wreath of opacite, and up to ·06 in length.

Augite Andesite.

Dunedin—A compact greenish-grey rock not shewing porphyritic minerals. S.G. 2·44. Section: Ground-mass forming nearly the whole of the rock; a colourless glass usually longulitic but in places vitreous with numerous plagioclase microlites and laths up to ·02, and with scattered grains of magnetite and small patches of chlorite. The porphyritic minerals are felspar and augite. The felspar is allotriomorphic and up to ·05 in diameter. The augite is purple and slightly pleochroic, absorption $\gamma > \alpha$ or β; it goes up to ·07 in length and is margined with grains of augite, chlorite, and magnetite. Small black prisms, up to ·015, scattered through the ground-mass may be altered augites. From the quarry at Logan's Point; it is used for road-metal in Dunedin.

Cave Valley, Oamaru.—A dark greenish-black compact rock. S.G. 2·80. Section: Granular, composed of plagioclase, augite and ilmenite in a small quantity of globulitic base. The plagioclase is in laths about ·01 in length. The augite is in grains from ·001 to ·002 in diameter and is distinctly gregaritic (Plate viii., fig. 7), the clusters going up to ·04 in diameter, sometimes they enclose the felspars and so become semi-ophitic. Occurs as a dyke in diatomaceous ooze rock. Hutton, Trans N.Z. Inst., Vol. xix., p. 419.

Bank's Peninsula.—1. A brownish-grey rock with large yellowish-white felspars in groups. Section: Ground-mass abundant, microlitic, chiefly felspar plates about ·005 in diameter, with a few laths and some grains of augite and of chlorite. The porphyritic minerals are felspar and augite with some magnetite. The felspar is chiefly well twinned plagioclase in square sections, up to ·16 in length, but there is also, perhaps, a little sanidine. The augite is green and in small quantity, in crystals up to ·02 in length. There is also some chlorite after augite. Forms a dyke on the top of the hills behind Opawa. Morten's Buildings in Christchurch are built with it.

2. A compact grey rock, the porphyritic minerals few and small. S.G. 2·75. Section: Ground-mass very abundant, vitreous or crystallitic, clear, with numerous microlites of felspar and augite. The porphyritic minerals are plagioclase, augite, and apatite. The

felspars are few and go up to ·05 in length. The augite is rare and not more than ·02 in length. The apatite is in small brownish hexagonal prisms occasionally terminated by pyramids, length ·005 to ·01, breadth ·001 to ·002. They are distinctly dichroic, changing from pale brown to purplish-brown. E ⊱ O. A high magnifying power shews that they are really colourless but with inclusions in longitudinal bands, which make them appear to be longitudinally striated. Quarry behind Summer on the Lyttelton Road. Interesting from the apatite crystals which are like those in the Hornblende Andesite from Dunedin, but are smaller.

3. A dark grey, sub-vitreous, compact rock, divided into layers by parallel, curved narrow pale bands, along which the rock splits. S.G. 2·51. Section : Ground-mass abundant, crystallitic, banded lighter and darker, the darker parts thick with magnetite dust, and crowded with minute felspar microlites which shew fluxion in the direction of the banding. The porphyritic minerals are plagioclase, augite, and magnetite, there is also a yellow-brown decomposition product present. The plagioclase goes up to ·04 in length. The augite is not abundant, it is green and goes to ·025 in length Magnetite is in crystals. Part of a lava stream near Heathcote.

Coal Creek, Rangitata.—A black sub-vitreous rock with yellowish felspars. S.G. 2·55. Section : Ground-mass abundant, crystallitic, globulitic, with scattered minute felspar microlites. The porphyritic minerals are plagioclase and augite. The plagioclase is not well twinned, occasionally pseudo-schillerised, goes to ·08 in length. The augite is brownish-green, sometimes decomposed into an isotropic yellowish-green chlorite ; it is not abundant and goes to ·02 in length. Haast, Geology of Canterbury, p. 279 (Melaphyre).

Fern Gully, Clent Hills, Ashburton Co.—A brownish-black rock with yellowish felspars. S.G. 2·685. Section : Ground-mass moderate, crystallitic, globulitic, with felspar laths (·02) and augite grains, which are gregaritic. The porphyritic minerals are plagioclase, augite, and magnetite. The plagioclase crystals are not abundant, but go up to ·09 in length. The augite is pale greenish, small, partly altered into a brownish-green chlorite. Haast, Reports Geol. Expl., 1872-4, p. 7, and Geol. Cant. p. 282, (Melaphyre).

High-peaks, Malvern Hills.—A very dark grey rock with abundant yellowish felspars. S.G. 2·82. Section : Ground-mass abundant, crystallitic, longulitic, with magnetite grains and chloritic infiltrations, and crowded with microlites of felspar and colourless augite. The plagioclase is in laths up to ·15 in length. The augite is in small broken purplish crystals.

Castle Hill, Selwyn Co.—Brownish-black compact rocks with white or yellowish felspars more or less conspicuous. S.G. 2·6 to

2·7. Section : Ground-mass abundant, microlitic with both felspar and augite ; the felspars ·003 in length, and rather in excess of the augite. There is also a considerable amount of chlorite. Scarcely porphyritic, but scattered felspar laths up to ·015 in length, and grains of pale greenish augite, ·02 in diameter, often glomero-porphyritic. Much of the augite is changed to chlorite. Magnetite and ilmenite also occur. In dykes. Hutton, Trans., N.Z. Inst., Vol. XIX., p. 403.

Tekoa, Amuri District.—A pale grey compact rock with brownish spots of decomposing augite. S.G. 2·46. Section : Ground-mass very abundant, felsitic, almost colourless, with dark spots of magnetite, and yellow-brown spots of a transparent mineral aggregate ; shews a mosaic with crossed nicols. The porphyritic minerals are plagioclase and augite. The plagioclase crystals are much altered but still shew polysynthetic twinning, they go up to ·08 in length. Augite is very rare, it is yellowish-green and goes to ·01 only. Associated with slates at the Mandamus River. Hutton, Reports Geol. Explorations, 1873-4, p. 35.

Mount Egmont, Taranaki.—Very dark grey rocks with large crystals of green augite and smaller white felspars. S.G. 2·69 to 2·86. Section : Ground-mass moderate or small, crystallitic, globulitic, a brown glass opaque with magnetite dust. The porphyritic minerals are plagioclase, augite and magnetite. The augite is greenish, idiomorphic, in large crystals up to ·10 in length. The plagioclase crystals are zoned and up to ·08 in length.

Another specimen is grey, granular in appearance, of small greyish-white felspars and no large crystals. The ground-mass is small, longulitic and contains a little broken brown hornblende with opacite wreaths. From the northern slopes of the mountain.

Ruapehu.—A black, sub-vitreous rock, indistinctly banded and with scattered small felspars. S.G. 2·614. Section : Ground-mass very abundant, crystallitic, banded with blackish and dark grey layers, the dark layers with microlites shewing fluxion. The porphyritic crystals are plagioclase and augite. The plagioclase in crystals up to ·035 in length. The augite in small broken crystals only. From the south slopes of the mountain.

Mount Pirongia.—A brownish-grey rock speckled with white felspars but no large crystals. Section : Ground-mass small in quantity, crystallitic, longulitic, the glass brown, with numerous microlites of felspar and augite. The porphyritic minerals are plagioclase, augite, and magnetite. Plagioclase crystals are numerous, up to ·03, but a few go to ·08, they shew central decomposition. The augite is greenish, partly idiomorphic, partly in grains ·02 in diameter and glomero-porphyritic, the clusters ·06 in diameter or less. There is a little apatite. Hochstetter, New Zealand, p. 314 ; Park, Rep. Geol. Expl., 1885, p. 140.

Okaro, Tauranga Co.—A very dark grey, almost black rock, with irregular, angular, white inclusions ; no porphyritic crystals visible. Section : Ground-mass abundant, crystallitic, globulitic, containing numerous felspar laths up to ·01 in length. Porphyritic minerals are plagioclase, not common, up to ·02 in length, and magnetite. There is no fluxion structure. Enclosed are angular fragments of a white, translucent or opaque, rhyolite, between crystallitic and felsitic, perhaps kaolinised. Thrown out of the 'Black Crater' at Okaro, during the eruption of June 1886. Hutton, Quart. Jour. Geol. Soc. of London, Vol. XLIII., p. 184.

Professor Thomas has come to the conclusion that no Augite Andesite was thrown out of the Black Crater during the eruption. [Report of the Eruption of Tarawera, Wellington, 1888, p. 55.] But angular fragments of non-scoriaceous andesite were found, so far as I know, only near the Black Crater, and here on the 28th June, I found them in abundance. On the 20th June Mr. H. Boscawen saw stones thrown out of the north corner of the Black Crater, some of which he picked up : two of these he gave to me, and they were Augite Andesite. On Professor Thomas' theory these stones must have been thrown out of Tarawera into the Black Crater during the time it was in violent eruption on the 16th June, and they must have remained in it for ten days notwithstanding constant eruption. Also when I was at Okaro black rock could be seen in the crater wall—indeed it was from this that it got the name. Professor Thomas did not visit the locality until three weeks later, when the black rock was probably covered up by mud slips.

Mt. Tarawera, Tauranga Co.—Black, highly vesicular, angular fragments, sometimes containing angular fragments of a white rock. Section : Ground-mass very abundant, crystallitic, globulitic very opaque. Porphyritic minerals very scarce and small. Plagioclase in broken fragments up to ·02 inch. Augite greenish-yellow in square prisms ·02 in length. Contain fragments of decomposed hornblende rhyolite passing into pumice. Thrown out of the Mountain during the eruption of 10 June, 1886 ; picked up at Pakaraka, and Galatea. Much like the last, but the rock itself and the included fragments are much more vesicular.

Te Aroha, Thames District.—A compact greyish-black rock with crystals of greenish, glassy, felspar. S.G. 2·70. Section : Ground-mass abundant, crystallitic, longulitic, with numerous felspar microlites, not shewing fluxion. The porphyritic minerals are plagioclase, augite, and magnetite. The plagioclase is much decomposed, and goes up to ·06 in length. The augite is idiomorphic, pale yellowish, up to ·02 in length. Secondary minerals are chlorite and calcite. Waiorongomai River, just behind the

battery. Cox, Reports Geol. Explorations, p. 16, Sect. No. 2 (Dioritic Rock).

Komiti Peninsula, Kaipara.—A greyish-black, compact, sub-vitreous rock, with scattered small white felspars. S.G. 2·64. Section : Ground-mass very abundant, crystallitic, longulitic, in a brownish glass ; crowded with minute felspar microlites and a few magnetite grains ; no fluxion structure. The porphyritic minerals are plagioclase and augite, the former going to ·04, the latter to ·02 in length. Park, Reports Geol. Expl. 1885, p. 167, and 1886-7, p. 220.

Enstatite Andesite.

Malvern Hills, Selwyn Co.—A greyish-black sub-vitreous rock with small scattered felspars. S.G. 2·66. Section : Ground-mass moderate, crystallitic, globulitic, with scattered felspar microlites not shewing fluxion. The porphyritic minerals are plagioclase, augite, and enstatite. The plagioclase goes up to ·07 in length, and is partly in ophitic plates enclosing augite and enstatite. The augite is allotriomorphic, in large grains only. The enstatite is colourless or pale green, and not pleochroic ; it has low polarization colours and is not much cleaved, often idiomorphic, the crystals going to ·04 in length and giving straight extinctions. There is also a little chlorite. Snowy Peak. Haast., Rep. Geol. Expl. 1870-1, p. 12 ; Cox, l.c., 1883-4, p. 35.

Sugarloaves, Taranaki.—A fine grained, grey rock, with numerous small white felspars and scattered small pyroxenes. S.G. 2·69. Section : Ground-mass moderate, crystallitic, longulitic, the glass colourless ; with scattered felspar microlites and numerous grains of magnetite. The porphyritic minerals are plagioclase, augite, enstatite, and magnetite. The plagioclase is zoned and goes up to ·07 in length. The augite is pale greenish, up to ·04. The enstatite is subordinate to the augite ; it goes up to ·03 in length ; it is distinctly pleochroic changing from pale yellowish-brown to reddish-brown.

Ruapehu.—1. A grey compact rock with scattered small pyroxenes and occasionally rather conspicuous felspars. S.G. 2·66. Section : Ground-mass abundant, crystallitic, longulitic, the glass pale ; crowded with microlites of felspar and augite shewing fluxion, as well as magnetite grains. The porphyritic minerals are plagioclase, (·05), greenish augite (·04) and enstatite (·06). The last is pleochroic, changing from brown to blue-green. From the south-east slopes of the Mountain.

2. Dark grey rock with scattered felspars and pyroxenes, not conspicuous Another specimen is reddish-brown with conspicuous pyroxenes but no felspars. S.G. 2·60. Section : Ground-mass abundant, crystallitic, globulitic, opaque with grains of either magnetite or hæmatite. The porphyritic minerals are plagioclase

(·02 to ·04), pale greenish augite (·02 to ·06) and enstatite (·02 to ·03). The last is idiomorphic, pleochroic, α and β yellow-brown to reddish-brown, γ bluish-green. From the southern and western slopes of the mountain.

Lake Taupo.—Black sub-vitreous rocks with abundant yellowish felspars and less conspicuous pyroxenes. Section : Ground-mass abundant, vitreous, a brown or dark brown glass with either scattered magnetite granules, or scattered colourless crystallites in bands and clusters. The porphyritic minerals are plagioclase, augite, enstatite and magnetite. The plagioclase is not zoned, but sometimes pseudo-schillerised, and up to ·15 in length. The augite is yellowish-green, up to ·03 in length. The enstatite is more abundant than the augite, goes to ·05 in length, pleochroic, changing from brownish-yellow to bluish-green. Fragments picked up on the north shore of the lake.

Mount Horohoro, Rotorua.—A black sub-vitreous rock with scattered yellowish felspars. S.G. 2·545. Section : Ground-mass abundant, vitreous, a brown glass with scattered magnetite grains and minute felspar microlites shewing fluxion. The porphyritic minerals are plagioclase, augite, enstatite and magnetite. The plagioclase crystals go to ·04, they are not much twinned. The augite is pale greenish, in small quantity, up to ·04. The enstatite is pleochroic changing from reddish-brown to bluish-green. Hochstetter, New Zealand, p. 403.

White Island, Bay of Plenty.—A brownish-grey rough rock with abundant white felspars. Section : Ground-mass moderate, crystallitic, globulitic, with magnetite and hæmatite. The porphyritic minerals are plagioclase, augite, enstatite and magnetite. The plagioclase goes to ·15. The augite is greenish. The enstatite is usually about ·04 in length, slightly pleochroic, changing from yellowish-brown to yellowish-green. The augite and enstatite sometimes form intergrowths. Hector, Trans. N.Z. Institute, Vol. III., p. 278.

Thames Gold-fields.—1. Greenish-black, semi-vitreous rocks with greenish-white felspars and black pyroxenes. S.G. 2·72. Section : Ground-mass abundant, vitreous, a brown glass crowded with small felspar laths and with rather large magnetite grains. The porphyritic minerals are plagioclase, augite, enstatite or protobastite and magnetite. The plagioclase is generally clear and zoned, often in binary twins, goes up to ·04. Augite is not abundant, pale greenish-brown, sometimes twinned, goes up to ·03, sometimes glomero-porphyritic, the clustres ·08 in diameter. The enstatite is idiomorphic, slightly pleochroic, changing from yellow-brown, to bluish:green ; sometimes forms intergrowths with augite. Occasionally the axial plane lies in the macropinacoid in which case the mineral is protobastite. There is no chlorite nor pyrites.

Forms masses between Karaka and Waiotahi Creeks. It is the miocene dolerite of Mr. Cox, Rep. Geol. Expl., 1882, p. 19.

2. Greenish- or greyish-black rocks with greenish-white felspars and black pyroxenes. S.G. 2·74 to 2·78. Section: Ground-mass small, microlitic or crystallitic (longulitic), often different textures in the same specimen, the glass colourless, with numerous felspar laths and scattered, rather large grains of magnetite. The porphyritic minerals are plagioclase, augite, enstatite and magnetite. The plagioclase goes to ·04 in length, it is zoned and often much decomposed. The augite is pale yellow, idiomorphic, from ·02 to ·05 in length, often altered into a blue-green chlorite. The enstatite is idiomorphic, from ·03 to ·06 in length, pleochroic, changing from yellow-brown to bluish-green; sometimes intergrown with augite, sometimes glomero-porphyritic. Often altered into a pleochroic bastite, changing from yellow-brown to bluish-green, but distinguished from the enstatite by being striated and having low polarization colours. Apatite is not uncommon as enclosures in the pyroxenes. There is also sometimes pyrites. From Karaka and Waiotahi Creeks. Hutton, Report Geol. Expl. 1868-9, p. 20, (Dolerite); Hector, l.c., p. 40, Table of Analyses, No. IX.

3. A greenish-black rock with abundant small felspars. S.G. 2·73. Section: Ground-mass small, vitreous, a pale brown glass crowded with small felspar plates and grains of magnetite, and with chloritic infiltrations. The porphyritic minerals are plagioclase, augite, bastite (after enstatite) and magnetite. The plagioclase is zoned, goes up to ·06 in length. The augite is pale greenish-yellow and up to ·04. The bastite is idiomorphic pseudomorps after enstatite, an aggregate with maximum extinction parallel to the cleavage; it goes up to ·03. Apatite is present as inclusions in the pyroxenes. Other secondary minerals are chlorite after augite, pyrites, and a little calcite. From the 330 foot level of the Prince Imperial Mine.

These three rocks form a series differing in the amount of decomposition they have undergone, and passing into the Chloritic Andesites from the same district.

Puponga Point, Manukau Harbour.—1. A brownish-grey rock with scattered felspars and occasional pyroxenes. S.G. 2·52. Section: Ground-mass moderate, crystallitic, the glass brown; crowded with microlites and small crystals of felspar. The porphyritic minerals are plagioclase, augite, enstatite and magnetite. The plagioclase goes to ·08 in length. The augite is pale greenish, to ·04. The enstatite allotriomorphic, pleochroic, changing from reddish-brown to bluish-green, up to ·03 in breadth, generally intergrown with augite.

2. A reddish-brown vesicular rock, the vesicles lined with a pale green mineral. Section : Ground-mass dense with hæmatite dust. The porphyritic minerals are plagioclase and enstatite. A chloritic mineral infiltrates the felspars and enstatites ; the latter are often decomposed into chlorite and a colourless aggregate with low polarization colours. The vesicles are lined with a chloritic mineral probably delessite, and filled with a colourless mineral with dull polarization colours, probably calcite. Hochstetter, New Zealand, p. 261 ; Park, Rept. Geol. Expl. 1885, p. 156.

Helensville, Kaipara.—A dark brown compact rock with small yellowish felspars, not conspicuous, and occasional pyroxenes. S.G. 2·78. Section : Ground-mass moderate, crystallitic, globulitic, a brown glass thick with hæmatite dust. The porphyritic minerals are plagioclase, augite, enstatite, and magnetite. The plagioclase is zoned, and goes to ·04 in length. The augite is idiomorphic, greenish-yellow, up to ·06 in length. The enstatite is subordinate to the augite, pleochroic, changing from yellow-brown to yellow-green, goes up to ·02 in length ; sometimes forms intergrowths with the augite.

Komiti Peninsula, Kaipara.—A greyish-black compact rock with very small felspars and pyroxenes not conspicuous. S.G. 2·74. Section : Ground-mass moderate, crystallitic, longulitic, the glass pale ; with some felspar microlites and abundant magnetite grains. The porphyritic crystals are plagioclase, augite, and enstatite. The plagioclase is in imperfect crystals, rarely over ·04 in length. The augite is pale greenish, up to ·02. The enstatite is pleochroic, changing from yellowish-brown to bluish-green, up to ·03. Park, Rept. Geol. Expl., 1885, p. 167, and 1886-7, p. 220.

Whangarei Heads.—A rather pale grey rock with scattered crystals of pyroxene. S.G. 2·66. Section : Ground-mass abundant microlitic, composed of felspar laths, up to ·01 in length, closely meshed, with augite in grains and prisms, and magnetite in grains. The porphyritic minerals are plagioclase, augite, enstatite and magnetite. Secondary constituents are a little quartz and magnetite. The plagioclase crystals are few and much decomposed, up to ·04 in length. The augite is pale brownish-green, idiomorphic, up to ·04 in length. The enstatite preponderates over the augite, pleochroic, changing from reddish-green to bluish-green, up to ·04 in length.

Olivine Andesite.

Bank's Peninsula.—1. A pale grey vesicular rock, with conspicuous felspars and black hornblendes and augites. Section : Ground-mass abundant, microlitic, of felspar laths and plates from ·007 to ·01 in length, with grains of augite, and magnetite, and

alteration products. Fluxion very apparent. The porphyritic minerals are plagioclase, augite, hornblende, olivine (altered) and magnetite. The plagioclase crystals go to ·13 in length. The augite is greenish-brown, not abundant, idiomorphic, up to ·06 in length, slightly pleochroic when in thick sections. The hornblende is rare, dark brown, in long broken prisms. The olivine is altered into a dark brownish-red translucent mineral, probably hæmatite. There is also occasionally a colourless aggregate. Hoon Hay Quarry, above Governor's Bay. Several of the bridges over the Avon are built with this stone.

2. A dark grey rock thickly crowded with white felspars, up to ·30 in length, the other porphyritic minerals not conspicuous. S.G. 2·81. Section: Ground-mass moderate or small, crystallitic, crowded with felspar microlites, the isotropic portion generally opaque with longulites and containing rather large grains of magnetite in abundance. The porphyritic minerals are plagioclase, augite, and olivine (altered). The augite goes up to ·03. The olivine is altered into a red translucent hæmatite. Secondary hæmatite surrounds the magnetites. Port Hills. Used in building Canterbury College and parts of the Museum in Christchurch.

In other specimens of the same kind of rock from the Sumner and Lyttelton road, some of the olivine is unaltered.

3. Grey compact rocks with scattered felspars and augites. S.G. 2·66 to 2·69. Section: Ground-mass abundant, vitreous or microlitic with abundant felspar microlites, and scattered magnetite grains. The porphyritic minerals are plagioclase, augite, and olivine. The plagioclase goes to ·10, often not abundant. The augite is pale greenish-brown, up to ·03. The olivine is colourless, up to ·03; sometimes altered to red-brown translucent hæmatite. Heathcote and Sumner Road, in several places.

Mount Egmont.—A grey rock with small felspars and conspicuous black pyroxenes. S.G. 2·84. Section: Ground-mass moderate, crystallitic, longulitic, thickly strewn with microlites of felspar and grains of magnetite. The porphyritic minerals are plagioclase, augite, olivine, and magnetite. The plagioclase is abundant but small, up to ·04 but generally less, squarish or in laths. The augite is in large yellow-green crystals up to ·08 in length. The olivine is colourless, scarce, up to ·05 in length. From the northern slopes of the mountain.

Chloritic Andesite.

The whole of the bisilicates changed into hydrous unisilicates.

Nelson District.—1. A dull pale green rock, compact and homogeneous except occasional black patches. S.G. 2·86. Section: Ground-mass very abundant, crystallitic, partly felsitic, colourless but full of chloritic infiltrations and specks of leucoxene. The

only porphyritic crystals are plagioclase ; these are much altered and filled with a colourless aggregate shewing rather vivid polarization colours. They are small, not more than ·03 in length. Some have infiltrations of a pale green chlorite, which is partly isotropic, and partly shews low polarization colours. There are also long colourless needles, generally with chloritic infiltrations ; it is doubtful what these are as they rarely shew crystallographic faces. Interbedded with the Maitai Slates in Brook Street Valley.

2. Greenish-grey compact rocks, more or less mottled with pale greenish-yellow epidote. S.G. 2·85 to 2·87. Section : Ground-mass very abundant forming nearly the whole of the rock, partly vitreous, partly felsitic ; some specimens with felspar microlites (·006 in length) shewing evident fluxion ; others with microlites and round balls of a chloritic mineral which is chiefly isotropic. A small mosaic is generally apparent in the felsitic portion. Magnetite, hæmatite and leucoxene are scattered in small specks through the ground-mass. Felspar, in small fragments, is the only porphyritic mineral, and even these are scarce and too much altered for determination. Secondary epidote occurs in veins and in masses. Associated with tuffs of a similar character at Mackay's Bluff, on the south-west side of the syenite. McKay, Reports Geol. Explorations, 1878-9, p. 111 (Serpentine).

Hauraki Gold-fields.— Dark or light greenish-grey rocks, sometimes speckled with white, and weathering to greyish-white. Hutton, Pro. Australasian Association, 1888, p. 245.

(A) With pseudomorphs after hornblende and Augite.

(Propylite.)

a. With quartz.

1. Dark greenish-grey rocks with greenish-white felspars. S.G. 2·62 to 2·70. Section : Ground-mass abundant, crystallitic or felsitic without mosaic, colourless, with scattered magnetite granules. The original porphyritic minerals still remaining are quartz, plagioclase, and magnetite. Secondary minerals are chlorite and magnetite after augite, and either chlorite or calcite after hornblende. The quartz is rare, allotriomorphic, from ·01 to ·04 in diameter, corroded. Plagioclase crystals up to ·06 in length. On the shore north of Tararu Creek.

b. Without quartz.

2. Ground-mass abundant, microlitic, or crystallitic, partly felsitic, with scattered grains of magnetite. Original porphyritic minerals are plagioclase and magnetite. Secondary minerals are calcite with opacite wreath after hornblende, and bluish-green chlorite or bastite after augite. The felspars are small and much decomposed ; the chlorite is nearly isotropic, the bastite is pleo-

chroic, changing from yellow-green to blue-green. Apatite occurs in the chlorite pseudomorphs. Other secondary minerals are quartz, magnetite, and leucoxene. S.G. 2·66 to 2·73. From Karaka and Waiotahi Creeks.

3. Ground-mass moderate, crystallitic, longulitic, with numerous felspar microlites and rather large grains of magnetite. Original porphyritic minerals are plagioclase and magnetite. Secondary minerals are chlorite after augite and calcite after hornblende. The plagioclase goes up to ·08, it is much decomposed but distinctly zoned. The hornblendes are filled sometimes with chlorite, sometimes with calcite and a magnetite wreath. The chlorite in the hornblendes is greenish-brown and slightly pleochroic, that in the augite is blue-green and almost isotropic. S.G. 2·68. Forms a dyke on the shore a little north of Tapu Creek.

(B) With pseudomorphs after augite only.

4. Ground-mass abundant or moderate, partly vitreous and partly felsitic, rather opaque with small specks of leucoxene, colourless but with infiltrations of green chlorite. Original porphyritic minerals are plagioclase and magnetite. Secondary porphyritic minerals are chlorite after augite. Other secondary minerals are quartz, calcite, pyrites, and leucoxene. Apatite occurs in the chlorites. S.G. 2·45 to 2·59. From Te Aroha and Thames district generally. These rocks form the country in which the auriferous veins are situated. Hutton, Rep. Geol. Expl. 1868-9, p. 18 (Trachytic tufa); Hector, l.c., p. 40, Table of Analyses II. to VI.; Davis, l.c., 1870.1, p. 56; Cox, l.c., 1882, p. 4; McKay, l.c., 1885, p. 192.

(C) With pseudomorphs after augite and enstatite.

a. With quartz.

5. A dark greenish-grey rock, with greenish-white felspars. S.G. 2·70. Section: Ground-mass rather abundant, crystallitic, a colourless glass with crystallites and scattered globulites of magnetite. Porphyritic minerals are quartz, plagioclase, chlorite (after augite), bastite (after enstatite) and magnetite. The quartz is rare, in grains ·02 or ·03 in diameter. The felspars go to ·06 and the bastite to ·03 in length. Waiotahi Creek.

b. Without quartz.

6. Ground-mass moderate or small, felsitic, with chloritic infiltrations. Original porphyritic minerals are plagioclase, and magnetite. Secondary minerals are chlorite after augite, and bastite after enstatite. Other secondary minerals are quartz, calcite, pyrites and leucoxene. The felspars are much decomposed and sometimes have chloritic infiltrations. The chlorite is blue-green and partly isotropic, partly anisotropic and slightly pleochroic.

The enstatite is pleochroic, changing from yellow to blue-green. S.G. 2·66 to 2·72. Forms dyke-like masses in Karaka and Moanatairi Creeks. Hutton, Rep. Geol. Expl. 1868-9, p. 20 (Melaphyre); Hector, l.c., p. 40, Table of Analyses No. VII.

Great Barrier Island.—A dark grey compact rock with scattered inconspicuous, white felspars and small black crystals. S.G. 2·73. Section: Ground-mass abundant, vitreous, colourless, with grains of magnetite and of chlorite and crowded with felspar microlites. Original porphyritic minerals are plagioclase only. Secondary minerals are chlorite after augite. The plagioclase goes to ·06 and the chlorite to ·04. The latter is slightly pleochroic changing from yellowish to bluish-green, and shews rather bright polarization colours. There are also some pyrites.

LIME-MAGNESIA SERIES.

Silica 55 to 43 per cent. Iron oxides 8 to 18 per cent. The lime alone is more than the alkalies, more than half the alumina, and equal to or rather less than the magnesia. The ferro-magnesian silicates predominate over the felspars, which are Labradorite to Anorthite. Quartz is never present as an original mineral. Lime attains its maximum of 7 to 14 per cent. S.G. 2·8 to 3·1.

GABBRO GROUP.

Granitic compounds of plagioclase with augite, enstatite, olivine, and occasionally with hornblende. The plagioclase is usually in broad plates. Rarely meteoric.

Hornblende Gabbro.

Riwaka Valley, Waimea Co.—Coarsely grained dark green rocks with white felspar and greenish black hornblende, the latter usually forming more than half the rock. S.G. 2·99. Section: The felspar is much altered, but the greater part is certainly plagioclase. It is in broad platycrystals from ·02 to ·10 in breadth. There is no quartz. The hornblende is brown, but much altered to greenish-brown, allotriomorphic, from ·04 to ·06 in length, and much crushed; probably it is altered augite. Secondary minerals are some chlorite and brownish serpentine.

Augite Gabbro.

Acheron River, Selwyn Co.—A coarse grained dark rock, made up of greenish felspar and black augite. S.G. 3·03. Section: Composed of plagioclase, augite, ilmenite and titaniferous magnetite with some biotite and apatite. The felspars give rather broad sections from ·08 × ·03 to ·04 × ·03, but in some specimens laths, ·08 × ·01, are mixed with broad plates. The augites are from ·02 to ·08 in length: there are two kinds, one pinkish, the other browner and slightly pleochroic. Secondary minerals are leucoxene,

a little chlorite and serpentine, and radiating tufts of a zeolite Hector, Rep. Geol. Expl. 1870-1, p. 49, Sect. 3; Haast, l.c. 1871-2, pp. 26 and 73, Geol. of Canterbury, p. 301; Hutton, Rep. Geol. Expl. 1872-3, p. 42; Daintree, Trans. N.Z. Inst., Vol. VII., p. 459.

Enstatite Gabbro.

(Norite.)

Mata River, Waiapu District.—A coarse grained rock made up of white felspar and dark brown pyroxenes. S.G. 2·80. Section: The felspars all give broad sections; they rarely shew polysynthetic twinning, but cleavage flakes in convergent polarised light shew an optic axis sometimes on the edge of the field, sometimes well inside it; the former are bytownite, the latter anorthite. They are rarely under ·04 in length and sometimes ·25 × ·25 inch. The pyroxenes are all allotriomorphic, and go up to ·10 in length. The commonest is diallage, but augite and bastite are also present. The bastite is pleochroic changing from yellow-green to blue-green: cleavage flakes shew a negative bisectrix. Secondary minerals chlorite, slightly pleochroic, and a small quantity of pyrites. Boulders in the river bed.

Saussuritic Gabbro.

(Euphotide.)

Dun Mountain, Nelson.—A coarse grained rock composed of saussurite, pyroxene, and some hornblende, in crystals up to ·30 × ·40. Section: The pyroxenes are diallage and enstatite; the first is yellowish, not pleochroic, and cleavage flakes shew an optic axis: the second is pleochroic, changing from reddish-yellow to blue-green. The hornblende is also pleochroic, changing from yellow-green to blue-green; the angle $\gamma : c = 19°$. Secondary minerals are a little chlorite and epidote. Forms a dyke in serpentine. Hochstetter, Lectures on the Geology of New Zealand, p. 94 (Gabbro), and 'New Zealand,' p. 475 (Diallage Rock); Hutton, Trans. N.Z. Inst., Vol. XIX., p. 412.

Formerly I confused the ferro-magnesian minerals together and took them to be anthophyllite; a second examination of the rock has shewn me my error.

DOLERITE GROUP.

Microgranitic compounds of plagioclase with augite, enstatite, olivine and occasionally hornblende. The plagioclase is in laths. Sometimes with porphyritic minerals similar to those forming the ground-mass. Rarely meteoric.

Hornblende Dolerite.

Lyell, Buller Co.—A compact, greyish-black rock, with scattered porphyritic crystals of black augite and greenish olivine. S.G.

3·04. Section : Ground-mass abundant, between microgranitic and microlitic ; formed by plagioclase laths, ·005 in length, crystals of brown hornblende, ·003 to ·004 in length, crystals of pink augite, ·003 and upwards, and grains of magnetite ; the plagioclase being quite subordinate. In addition to these minerals there are a number of colourless needles often arranged parallel to each other, which penetrate the felspar laths ; probably they are either Wollastonite or else Tremolite. The porphyritic minerals are olivine and augite. The olivine is not very abundant, and mostly changed to serpentine ; when fresh it is of a pinkish-olive colour ; it goes up to ·08 in length. The augite is idiomorphic, and purplish in colour, lighter in the middle and with a broad peripheral zone darker ; not pleochroic ; in size up to ·06 in length but intermediate sizes occur connecting the porphyritic augite with that of the ground-mass. Forms a dyke in Granite, two miles from Lyell, on the Nelson road. Hutton, Trans. N.Z. Inst., Vol. XXII.

Augite Dolerite.

Springfield, Selwyn Co.—A dark brownish-grey rock, without porphyritic minerals. S.G. 2·88. Section : Granular ; composed of plagioclase, augite and magnetite. Secondary minerals are hæmatite, limonite, and a brown decomposition product with aggregate polarization. The plagioclase is in laths, from ·02 to ·05 in length, and with extinction angles between the lamellæ up to 40° ; it is therefore probably anorthite. The augite is brownish-green, chiefly allotriomorphic, from ·02 to ·06 in diameter, occasionally twinned, in places semi-ophitic. The magnetite is in considerable quantity but largely decomposed into limonite. Forms a small hill near the Railway Station. Haast, Rep. Geol. Expl., 1871-2, p. 26 (Kowai Corner) ; Geol. Cant. p. 300.

Olivine Dolerite.

Oamaru Cape, Waitaki Co.—Compact greyish-black rocks without porphyritic minerals. S.G. 2·80. Section : Granular, composed of plagioclase, augite, olivine (altered) and ilmenite, with perhaps a little opaque base. The plagioclase is in laths ·03 in length. The augite is either in grains ·62 in diameter or in prisms ·03 × ·001, and collected into bundles ; it is purplish and slightly pleochroic, granulitic. Secondary minerals are chlorite and serpentine after olivine. Hutton, Trans. N.Z. Inst. Vol. XIX., p. 417.

Moeraki Peninsula.—A yellowish-grey compact rock without porphyritic minerals. S.G. 2·88. Section : Ground-mass abundant composed of plagioclase, augite, olivine (altered) and ilmenite. The plagioclase is in laths, from ·01 to ·04 in length. The augite is pale greenish-yellow, in grains from ·003 to ·01 in diameter, often gregaritic, the clusters up to ·08 in diameter. The only porphyritic mineral is olivine which is altered into a green non-

fibrous product with aggregate polarization, these pseudomorphs go up to ·06 in length. The augite is also sometimes glomero-porphyritic, in clusters ·10 in diameter. Leucoxene is rather abundant. From the north side of the peninsula. Hutton, Geol. of Otago, p. 61 ; Trans. N.Z. Inst. Vol. XIX., p. 428 ; McKay, Rept. Geol. Expl. 1886-7, p. 239.

Timaru.—Brownish, or greyish-black vesicular rocks, without porphyritic mineral. Section : Granular, composed of plagioclase, augite, olivine, magnetite, and ilmenite ; filled up with decomposition products. The plagioclase is in laths, from ·01 to ·05 in length. The augite is in grains, from ·006 to ·012 in diameter. The olivine is not conspicuous, and in small crystals ·02 in length, mostly altered to brown serpentine. Haast, Geol. of Canterbury, p. 314.

Glentunnel, Malvern Hills, Selwyn Co.—1. A greyish-black compact rock. S.G. 2·79. Section : Granular, composed of plagioclase, augite, olivine (altered) and ilmenite, with decomposition products. The plagioclase is in laths, about ·02 in length. The augite is in grains, ·006 to ·01 in diameter, pale greenish. The olivine is altered into brownish-green, fibrous, serpentine. Other secondary minerals are leucoxene, white pyrites, and some chlorite. Forms a dyke like mass at the northern abutment of the bridge over the Selwyn.

2. A greyish-black compact rock with rather large crystals of olivine sparingly scattered. S.G. 2·88. Section : Ground-mass very abundant, between microgranitic and microlitic, formed of plagioclase laths, ·01 in length, and augite grains from ·001 to ·003. sometimes semi-ophitic, and magnetite grains, with perhaps a very small quantity of clear glass. The porphyritic minerals are plagioclase and olivine, neither abundant The plagioclase is from ·004 to ·12 in length. The olivine is in corroded grains from ·003 to ·02 in diameter. Forms a dyke in green sandstone, about a mile north of the town.

Harper's Hill, near Glentunnel.—A light grey vesicular rock, full of small yellow olivines. Section : Granular, composed of plagioclase, augite, olivine, and ilmenite, with dark decomposition products. The plagioclase is in laths, from ·006 to ·02 in length. The augite is abundant, in grains from ·003 to ·006 in diameter, granulitic. The olivine is colourless, up to ·05 in length, much altered into a yellow-green isotropic chloritic mineral. Hector, Rept. Geol. Expl., 1870-1, p. 50 ; Haast, Reports Geol. Expl., 1871-2, p. 24 ; Geol. Cant., p. 301.

East Gap, Rockwood, Malvern Hills—Dark, greyish-black, compact rocks, without porphyritic minerals. S.G. 2·93. Section: Granular, composed of plagioclase, augite, olivine, and magnetite. The plagioclase is in laths, from ·006 to ·015 in length. The

augite is in grains or angular fragments, from ·001 to ·003 in diameter; micro-ophitic in places, the plates ·025 in diameter; brownish-purple and slightly pleochroic, changing from yellowish-brown to purplish-brown. The olivine is colourless and in broken grains. Haast, Rept. Geol. Expl., 1870-1, p. 12 (Melaphyre); Hutton, l.c., 1872-3, p. 40 (Andesite); Cox, l.c., 1883, p. 35 (Melaphyre).

Castle Hill, Selwyn Co.—A rather coarse grained, greyish-black rock without distinct porphyritic minerals. S.G. 2·82 – 2·95. Section; Ground-mass composed of plagioclase, augite, ilmenite and magnetite, with decomposition products. The plagioclase is usually in laths ·01 to ·08 in length, but sometimes in allotriomorphic masses. The augite is in prisms. from ·006 to ·01 in length. The porphyritic minerals are augite and olivine. The augite is in crystals idiomorphic in the prismatic zone only, up to ·10 in length, pale greenish-brown, not pleochroic, the polarization colours not very brilliant. The olivine is colourless, idiomorphic, up to ·04 in length, partly altered into brownish-green serpentine. Boulder in a stream behind Prebble Hill.

Awatere, Marlborough.—A black, compact, rather soft rock without distinct porphyritic minerals. S.G. 2·81. Section: Ground-mass formed of plagioclase, in laths ·003 to ·02 in length, augite grains, ·002 in diameter, and prisms ·006 in length, with ilmenite and magnetite; granulitic. The porphyritic minerals are augite and olivine. The augite is allotriomorphic, pale brownish, and up to ·03 in breadth. The olivine is colourless, up to ·03 in length, much decomposed into brown fibrous serpentine. There is also a little pyrites and secondary magnetite. From the Grey Mare's Tail Waterfall below the confluence of the Blarich with the Awatere. Hochstetter, Lectures on the Geology of New Zealand, p. 63 (Serpentine).

Kakepuke, Waipa.—A dark brown, compact rock with conspicuous crystals of augite, S.G. 2·82. Section: Ground-mass rather small, composed of plagioclase laths, ·004 in length, minute grains of augite, and of magnetite; granulitic. The porphyritic minerals are large and abundant, plagioclase, augite, and olivine. The plagioclases have not sharply defined outlines, they are zoned and go up to ·04 in length. The augite is yellowish-green, sometimes in glomero-porphyritic clusters up to ·08 in diameter. The olivine is colourless, up to ·07 in length, some of it altered into serpentine. There is also a little hæmatite. Hochstetter, New Zealand, p. 317; Park, Rep. Geol. Expl., 1885, p. 140.

Saussuritic Dolerite.

(Leucophyre.)

Gorge of the Selwyn River, Malvern Hills.—Greyish-green to greenish-grey rocks, without porphyritic crystals. S.G. 2·96 to 3·65. Section ; Granular ; composed of white saussurite and pale brownish-green augite, both allotriomorphic, the relative amount varying, but perhaps, on the average in equal quantity. The saussurite forms a net work in which lie the augite grains, usually ·01 in diameter, but sometimes ·025 ; often broken, the parts sometimes with similar orientation, but usually independent. Secondary minerals are leucoxene and chlorite. Haast, Geol. Canterbury, p. 276 (Diabase) ; Hutton and Gray, Trans. N.Z. Inst., Vol. xx., p. 271.

BASALT GROUP.

Trachytic rocks composed of a semicrystalline ground-mass with microlites of felspar and augite, containing porphyritic crystals of augite usually with olivine and plagioclase, and occasionally with enstatite.

Olivine Basalt.

Oamaru, Waitaki Co.—A black, compact, vitreous rock. S.G. 2·72. Section : Ground-mass vitreous, a pale smoky-brown glass with numerous plagioclase laths, ·025 in length, and scattered grains of olivine ·002 to ·02 in diameter. Contains also greenish spherulites which shew a fixed interference cross parallel to the diagonals of the nicols. Partly decomposed into a yellow-brown palagonite on the outside. It is a Magma basalt. Forms a breccia with calcareous cement. Also a peripheral layer on dolerite bombs. Hutton, Trans. N.Z. Ins., Vol. xix., p. 417 (Tachylyte).

Geraldine.—A dark grey vesicular rock without porphyritic minerals. Section : Ground-mass very abundant, microlitic, of plagioclase laths, ·007 in length, and grains of augite, ·002 to ·003 in diameter, and magnetite, without any glass. The porphyritic minerals are augite and a little olivine, both colourless, and not larger than ·015 in length. Forms a hill at Waihi Bush. Haast, Geol. Canterbury, p. 314.

High Peak, Malvern Hills, Selwyn Co.—A grey rock full of small crystals of olivine. S.G. 3·14. Section : Ground-mass abundant, microlitic, composed of felspar microlites, ·003 to ·01 in length, and augite grains, ·002 to ·003 in diameter, partly granulitic, partly gregaritic (Plate viii., fig. 6.). Porphyritic minerals are olivines only which are abundant, idiomorphic, up to ·06 in length, and not much altered.

Castle Hill, Selwyn Co.—Greyish-black, compact rocks, without conspicuous porphyritic minerals, but sometimes with small olivines S.G. 2·82 to 2·95. Section : Ground-mass abundant, microlitic, granulitic, formed of plagioclase laths and plates, ·01 in length, augite prisms and grains from ·001 to ·002 in diameter, and

ilmenite in long plates ; in some cases with a little glass. The felspar sometimes exceeds the augite, sometimes the augite exceeds the felspar. Porphyritic minerals are chiefly augite and olivine ; plagioclase is occasionally present in laths ·035 in length. The augite is usually glomero-porphyritic, the granules from ·01 to ·02, and the clusters about ·08 in diameter ; it is pale greenish in colour. Olivine is abundant, colourless, up to ·04 in length, some of it altered to a brownish-green serpentine. Forms dykes in greensands, &c. Hutton, Trans. N.Z. Inst., Vol. XIX., p. 403.

Bank's Peninsula.—1. A grey compact rock, with scattered small olivines. S.G. 2·93. Section : Ground-mass very abundant, microlitic, granulitic, composed of felspar microlites (·005) and augite in grains and prisms with little or no glass. Porphyritic minerals are olivines only ; they are yellowish, usually about ·02 in length or smaller, but sometimes up to ·04. Port Hills. The usual road metal of Christchurch.

2. Dark grey to black, compact rocks, with scattered olivines, sometimes altered into iron oxides, augite, and felspar. S.G. 2·92 to 2·96. Section : Ground-mass abundant, crystallitic with a little clear base, crowded with microlites of felspar and augite, as well as grains of magnetite. Porphyritic minerals are plagioclase, augite, olivine, and in some cases magnetite. The plagioclase is in laths, up to ·16 in length, sometimes broken. The augite is pale green and up to ·12 in length, sometimes absent. The olivine is idiomorphic or allotriomorphic, either moderate or abundant, colourless, sometimes not above ·03, sometimes up to ·06 or ·08 in length, sometimes altered to a bright, red-brown translucent, anisotropic mineral, probably hæmatite. Many places in the Port Hills. The conspicuous dyke at the Hotel at Sumner is a vesicular basalt, and contains idiomorphic olivine. Haast, Trans. N.Z. Inst., Vol. XI., p. 449, and Geol. of Canterbury, p. 338, and Section 6, f. 7.

Mount Eden, Auckland.—A dark grey vesicular rock with thickly scattered small olivines. S.G. 3·01. Section : Ground-mass abundant, microlitic, granulitic, composed of augite grains, felspar microlites, and magnetite in rather large grains. Porphyritic minerals are augite and olivine. The augite is greenish-brown about ·01 in length and generally glomero-porphyritic. The olivine is more abundant than the angite, idiomorphic, up to ·04 in length, colourless. From near the jail. Hochstetter, New Zealand, p. 234.

Rangitoto Island, Auckland.—A light grey vesicular rock with thickly scattered small olivines. Section : Ground-mass abundant microlitic, composed of felspar laths ·02 in length, augite grains, partly granulitic and partly gregaritic, and ilmenite plates. Porphyritic minerals augite and olivine. The augite is pale yellowish-

green, glomero-porphyritic, the separate pieces close together, like a cracked crystal, but independently oriented, probably intergrowths of different crystals. The olivine is abundant, colourless, idiomorphic, up to ·03 in length. The rock from which the Calliope Dock is built.

Great Omaha, Rodney Co.—A brownish-grey, compact rock, with small olivines rather thickly scattered. S.G. 2·91. Section: Ground-mass abundant, microlitic, granulitic, made up of felspar laths and plates, augite grains, and ilmenite plates. The porphyritic minerals are augite and olivine. The augite is scarce, pale olive-green and goes up to ·015 in length. The olivine is abundant, colourless, up to ·04 in length, much decomposed into a brownish substance. Secondary minerals are hæmatite, limonite, magnetite and leucoxene.

Chloritic Basalt.

(Melaphyre.)

Nelson.—A compact, dark green rock, with dull fracture, shewing a few augite crystals. S.G. 3·02. Section: Ground-mass partly crystallitic, partly felsitic, enclosing altered felspars, and, in places, round balls of bluish-green anisotropic chlorite, and with infiltrations of isotropic chlorite. The porphyritic minerals are felspars, augite, and olivine (altered). The felspar is in shapeless masses rarely showing crystallographic faces, and is altered into saussurite. The augite is idiomorphic and generally well preserved. It is pale brownish-yellow, sometimes zoned and sometimes twinned; the crystals go up to ·17 in length. The olivine is altered into a brownish fibrous serpentine. Pyrites occurs in small scattered grains. Brook Street, Valley. Hochstetter, Lectures on the Geol. of New Zealand, p. 96 (Diabase); New Zealand, p. 58 (Pyroxene porphry); Davis, Rep. Geol. Expl. 1870-1, p. 116.

TACHYLYTE GROUP.

Amorphous rocks, crystallitic or vitreous, without any porphyritic minerals, and containing less than 60 per cent. of silica.

I do not here include the andesite and basalt glasses which occur as salbands on dykes &c., but only those basic glasses which form independent rock masses. It is inconvenient to include under the same name two glasses which have such different origins. No unaltered tachylyte is known in New Zealand.

Hydrotachylyte.

Dark brownish or greenish-black rocks, with from 10 to 20 per cent. of water; lustre sub-resinous to dull, soft. Very different in appearance from typical palagonite.

Look-out Bluff, Hampden, Otago.—Brownish-black, sub-resinous. Section: A pale brown glass with scattered short felspar laths, not micro-vesicular. Hutton, Trans. N.Z. Inst., Vol. xix., p. 429.

Enfield, Waitaki Co.—Brownish-black, sub-resinous, sparkling with small white crystals. Section : A brownish or greenish glass, micro-vesicular, vesicles crowded ·001 to ·005 in length. Occasional fragments of olivine. Hutton, Trans. N.Z. Inst., Vol. XIX., p. 419.

Waihao River, Waimate Co.—Greenish-black, dull, with minute white crystals. Section : A clear pale brown glass, marbled with patches dense with crystallites, not vesicular.

Two Brothers, Upper Hinds River.—Brown, sub-resinous to dull, containing minute black fragments. Section : A brown glass, micro-vesicular, vesicles not crowded, round or oval ·006 to ·01 in length, contains grains of olivine. Haast, Geology of Canterbury, p. 313, (Analysis).

Mount Somers, Ashburton Co.—Brownish-black, sub-resinous. Section : A brown glass rather full of crystallites, not vesicular.

Castle Hill, Selwyn Co.—Brownish-black, sub-resinous or dull. Section : A brown gloss, dense with crystallites, sometimes micro-vesicular, the vesicles round or oval, ·001 to ·007 in length. Hutton, Trans. N.Z. Inst., Vol. XIX., p. 402.

Division III.—NON-FELSPATHIC ROCKS.

Felspar absent, or in quite subordinate quantity. Ferro-magnesian silicates and either iron oxides or metallic iron, form the greater part of the rocks.

PYROXENITE GROUP.

Granitic compounds of augite, enstatite, hornblende, or biotite, with little or no felspar. No olivine.

Enstatite Pyroxenite.

Dun Mountain, Nelson.—A blackish-green granular rock. S. G. 3·10, Section : Composed of diallage and enstatite (altered to bastite), both allotriomorphic, and both from ·04 to ·10 in diameter, with small quantities of magnetite and pyrites. The diallage is pale green or colourless, with prismatic and orthopinacoidal cleavages ; cleavage flakes shew an oblique optic axis. It occupies about two-thirds of the rock. The bastite is fibrous, brownish-yellow, feebly pleochroic, changing from pale yellow to brownish-yellow when the fibres are parallel to the short diagonal of the nicol ; polarization colours not brilliant. Forms a dyke in Serpentine. Hochstetter, Lectures on the Geology of New Zealand, p. 94 (Hypersthenite).

Biotite Pyroxenite.

Dusky Sound, Fiord Co.—A granular, dark green, glittering rock, composed of biotite and hornblende in about equal proportions. S.G. 3·3. Sections : The biotite is in plates, ·06 to ·20 in length, brown, strongly pleochroic, nearly uniaxial. The hornblende is

allotriomorphic, up to ·10 in length, sometimes actinolitic or confusedly crystalline, and is probably altered augite. Apatite and a small quantity of magnetite occur as inclusions in the biotite. Hutton, Quar. Jour. Geol. Soc. of London, Vol. XLIV., p. 745.

Chloritic Pyroxenite.

Martin's Bay, Fiord Co.—A soft, dark green, granular rock. S.G. 2·96. Section: Composed of biotite and chlorite, in plates about equal in size, between ·005 and ·01 in diameter. The biotite forms the principal part of the rock. It is strongly pleochroic, yellow-brown when the cleavage planes are at right angles to the short diagonal of the nicol, and blue-green when they are parallel to it. Some of the biotite is more altered than this and is quite green in colour. The chlorite is blue-green and isotropic.

PICRITE GROUP.

Granitic compounds of olivine, enstatite, augite, and sometimes hornblende, with generally a little plagioclase, and often biotite. Silica 46 – 37 per cent. Iron oxides 10 – 16 per cent. S.G. 2·85 to 3·1. The magnesia is less in quantity than the silica, but more than the iron oxides, or the lime, or the alumina, and pyroxene is predominannt over olivine. Not yet known in New Zealand.

PERIDOTITE GROUP.

Granitic compounds of olivine and iron oxides, usually with enstatite or augite, or both. There is no felspar. Silica 40 – 32 per cent. Iron oxides 25 – 30 per cent. S.G. 3·21 to 3·8. The magnesia is equal to or more than the silica, and greater than the iron oxides. Alumina and lime are in small quantity. Magnesia attains its maximum of 30 to 47 per cent. Terrestrial or Meteoric.*

Dunite.

A compound of Olivine and Chromite.

Dun Mountain, Nelson.—A granular, yellow-green to greyish-green rock with black specks of chromite. S.G. 3·20 to 3·43. Section: Composed of olivine and chromite. The olivine is colourless, allotriomorphic, from ·002 to ·10 in diameter, with brilliant polarization colours, and much cracked. The chromite is in grains or in octohedra with rounded edges. Hochstetter, Lectures on the Geology of N-Z., p. 94; Zeit. Deut. Geol. Gesell. 1864, XVI., p. 341 – 344; Reise der Novara, Geologie von N.Z., pp. 217 – 220;

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* There is in the Colonial Museum at Wellington, a Meteorite which was found near Masterton in 1862, but it is uncertain whether it belongs here or to the Pallasite Group. It is 8·5 by 6 inches in size, and contains nickeliferous iron. Crawford, Essay on the Geology of the North Island, Trans. N.Z. Inst., Vol. I.

New Zealand, p. 274 (with analysis by Reuter). Skey, Col. Mus. and Lab. Report, No. 6, p. 17 (analysis). Davis, Report, Geoi. Expl. 1870-1, p. 110. Renard, Report Challenger Eepedition, Narative II., appendix B, pp. 22-23. For analyses by Schrötter and Madelung, see Wadsworth's Lithological Studies, p. 121, Table IV., p. xxviii., and Teall's British Petrography, p. 102.

Serpentine.

Altered peridotites, in which the olivine has been changed into serpentine, and the enstatite into bastite.

Dun Mountain, Nelson.—A brownish-black rock, moderately soft. S.G. 2·59 to 2·65. Section: Fibrous serpentine with magnetite in crystals and grains, scattered or collected into veins. Structure not distinct, but similar throughout. Evidently derived from one mineral—olivine—and shewing the same kind of cracks as the olivine of dunite from the same locality. Hochstetter, Lectures on the Geology of N.Z., p. 94; New Zealand, p. 274; Skey, Col. Mus. and Lab. Report, No. 6, p. 17; Davis, Rept. Geol. Expl., 1870-1, p. 110; McKay, l.c., 1878-9, p. 102.

Windley Creek, Centre Hill, Southland.—A greenish-black rock, moderately soft. S.G. 2·58. Section: Composed of fibrous serpentine, bastite, magnetite in veins and irregular masses, and pyrites in small crystals. Most of the serpentine shews 'mesh structure,' characteristic of altered olivine, but other parts shew laminated masses crossing at right angles and forming the 'knitted structure' characteristic of altered augite. The bastite is in large crystals, greenish-yellow, faintly pleochroic, changing from yellow-brown to green. Apparently an altered Lherzolite. Forms a dyke in Coal Hill.

Big Bay, Lake Co.—Serpentine as well as dunite, is found at Red Hill and other places inland from Big Bay. Near Barn Bay it contains sometimes an alloy of nickel and iron in the proportion 2 Ni. + Fe. (Ni. 67·63 + Fe. 31·02) which has been called Awaruite by Mr. W. Skey. The meteorite found in Oktibbeha Co. Missouri, contained Ni. 59·69 + Fe. 37·69, which was the highest nickliferous alloy previously known. This alloy has been called Oktibehite. Skey, Trans. N.Z. Inst., Vol. XVIII., p. 401.

PALLASITE GROUP.

Crystals of olivine, and often of pyroxene, in a matrix of iron which is usually nickeliferous. The iron is usually metallic, rarely as iron oxides (Cumberlandite). Iron 43 to 80 per cent., usually about 60 per cent. Silica 30 to 5 per cent. S.G. 3·5 to 7·3 usually between 4 and 6. The magnesia is less than half the iron and less than the silica. Known chiefly as Meteorites.

Cumberlandite.

The iron as oxides.

Dun Mountain, Nelson.—A dark green coloured rock, crystalline granular. Hardness about 2. Contains iron oxides (principally protoxide) 49·95 ; alumina and manganese 9·99, magnesia 5·6, and silica 26·03 per cent. W. Skey, Col. Mus. and Lab. Report, No. 23, p. 57.

Mr. Park informs me that this interesting rock occurs as a dyke about four feet wide, intersecting the serpentine not far from the junction of the associated slates. I have not seen a specimen myself. Cumberlandite is known from two places in Sweden as well as from Ironmine Hill, Cumberland, Rhode Island.

SIDEROLITE GROUP.

Composed chiefly of metallic iron, usually nickeliferous, with some pyrrhotite, schreibersite, and occasionally graphite and magnetite. Iron 80 to 98 per cent. Silica 5 to 0 per cent. Alumina, lime, and magnesia rarely over 2 per cent. S.G. 5·75 to 8·31, usually between 7·5 and 7·9.

Not found in New Zealand. Indeed the iron at Ovifak in Greenland is the only known terrestrial siderolite, all others being Meteorites.

Explanation of Plate.

Fig. 1. Centric texture in granite close to its junction with rhyolite, from Malvern Hills. Magnified 20 diameters. *a*. Brownish translucent quartz.

Fig. 2. Pumiceous texture in pitchstone from Mayor Island. Magnified 200 diameters. It shews elongated vesicles passing into trichites.

Fig. 3. Trichitic texture in spherulitic rhyolite from Rotorua. Magnified 200 diameters. It shews that trichites are much elongated vesicles ; usually as branches from larger vesicles.

Fig. 4. Inclusions of purplish-brown glass in quartz from the Hornblende Granite found in the Clutha District. Magnified 55 diameters.

Fig. 5. Group of Apatite crystals in Hornblende Andesite, from Dunedin. Magnified 55 diameters. Some of the crystals are three times as long as those drawn and with the same breadth, but the long crystals shew no pyramidal faces.

Fig. 6. Gregaritic and microlitic textures in a basalt dyke from High Peak, Malvern Hills. Magnified 25 diameters. *a*. A crystal of olivine.

Fig. 7. Gregaritic and globulitic textures in an andesite dyke from Cave Valley, Oamaru. Magnified 25 diameters.

WEDNESDAY, AUGUST 21, 1889.

A 'RECEPTION' to the members of the Royal Society of N.S.W. was held at the Society's House, at 8 p.m. At the invitation of the President and Council upwards of one hundred members were present, and spent the evening pleasantly in conversation and in inspecting a variety of exhibits of a scientific character.

Mr. Russell, the Government Astronomer, loaned an interesting chart of 16 drawings of Jupiter, four for each of the years 1876, '80, '85, and '89. These it may be mentioned, were selected from upwards of two hundred drawings of the planet made by him since 1876. Each set served to show the markings on the whole circumference of the planet, and displayed in a very striking way the great changes which go on in it from year to year. For instance, in 1876, Mr. Russell explained, there was a great extension of the equatorial belts, so much so that the great red spot was included, and formed as it were a part of them. By 1878 they contracted so that the spot was outside of them, and in 1880 they had their minimum extent and became very sharply defined and strikingly strong in colour, especially the northern one, which often looked like a girdle of red silk. In 1885, they had expanded again over half the red spot, but were chiefly remarkable for a great display of diagonal markings, and for the appearance of a second but smaller red spot in the same latitude, which, however, did not last long. At the present time they are about the same extent as in 1885, and they are remarkable for the absence of diagonal markings, which are replaced by a mottled pink surface between the main belts, looking very much like red clouds; and the red spot has become very faint, and there is a striking display of dark, almost black, patches on the side opposite the red spot. Mr. Russell further exhibited the driving clock for the star photo telescope, which is remarkable for its size, and for an entirely new method of electrical control, which obliges the wheels to keep absolutely the same time as a standard clock. He has designed this to provide for perfectly uniform motion in the star photo telescope, and the method is considered a great improvement upon those now in use in Europe. A number of charts showing at once the difference between the rainfalls of 1887 and 1888 were also lent by Mr. Russell.

Professor Stuart placed on view his recently invented "kymoscopes," instruments for illustrating the physical phenomena of the circulation of the blood and for demonstrating the interference of wave motion. A third exhibit was a model showing the action of the chest on the heart, a model from which the professor argued

that even though the heart be stopped artificial respiration should still be continued, for the movement of the chest in respiration not only drew air in but pushed air out of the chest, and also exercised an efficient mechanical action upon the heart itself, and carried on the circulation of the blood. The lesson to be learned from such a model was, he said, that even for a considerable time after the heart had stopped artificial respiration should be continued in cases of suffocation from whatever cause. Other exhibits by Professor Stuart were models of his own invention, showing how the walls of the chest expanded in inspiration ; how the shape of the human chest was evolved from that of quadrupeds ; and how the smaller canals were in all probability the under-organs of the senses of space. He further had on view Merey's apparatus demonstrating that it is better to interpose an elastic medium between, say a horse and a waggon, instead of employing a rigid trace.

By the courtesy of the Mines Department, a number of excellent fossils from the Geological Museum were displayed. These were in charge of Mr. Carne, and consisted of "lower mesozoic plant and fish remains found near Tallragar River." and "remains of extinct marsupials from post-tertiary ossiferous clays near Myall Creek, Bingera," descriptions of which are contained in the published "Records of the Geological Survey of New South Wales."

Mr. Wilkinson, the Government Geologist, placed on view a map prepared by the Department of Mines and Water Supply, Melbourne, of "Continental Australia."

Professor Liversidge exhibited a polished section through the Thunda Meteorite from Queensland, and a model of the complete Meteorite before cutting.

Mr. Hargrave exhibited his new type of engine for a screw-driven Flying-machine.

Mr. Hamlet, the Government Analyst, exhibited a new burglars' alarm.

Mr. T. F. Weissener exhibited one of Edison's phonographs, and a number of recent microscopic instruments.

Professor Warren, the recording portion of his testing machine.

Professor Threlfall, methods of testing the speed of sound waves.

The following gentlemen also kindly assisted by the loan of exhibits :—Messrs. S. Cornwell, two microscopes and spectroscope ; P. J. Edmunds, prismatic magnifying spectacles, apparatus and diagrams ; F. B. Gipps, photo album, Darling River in Flood ; G. D. Hirst, instantaneous photograph of lightning ; E. L. Montefiore, copy of the *Observator* published 1683, copy of the London *Herald* Jany. 28th 1797, containing a letter from Botany Bay dated 28th Dec., 1795 ; Hon. James Norton M.L.C., eight large photos of the Hawkesbury Sandstone ; P. C. Trebeck, twenty instantaneous

photographs of horse jumping hurdle—one leap only; Royal Society of N.S.W., Microscopes, medals and books, including a specimen copy of printed catalogue of the Society's Library, Part 1.

WEDNESDAY, SEPTEMBER 4, 1889.

Prof. LIVERSIDGE, M.A., F.R.S., President, in the Chair.

Twenty-seven members were present.

The minutes of the preceding meeting were read and confirmed.

The certificates of one new candidates was read for the second time, and of three for the first time.

Mr. H. G. M'Kinney, M.E., M.I.C.E., read a paper on "Irrigation in its relation to the Pastoral Industry of New South Wales."

A discussion ensued in which the following gentlemen took part viz., Judge Docker, Prof. Rennie, Messrs. J. Trevor Jones, J. T. Wilshire, M.L.A., P. N. Trebeck and the Chairman.

The thanks of the Society were accorded to Mr. M'Kinney for his valuable paper.

Sir Alfred Roberts exhibited a large collection of photo-micrographs taken by the late Capt. Francis.

The following donations were laid upon the table and acknowledged :—

DONATIONS RECEIVED DURING THE MONTH OF AUGUST, 1889.

(The Names of the Donors are in *Italics.*)

TRANSACTIONS, JOURNALS, REPORTS, &c.

ADELAIDE—Report on the Progress and Condition of the Botanic Garden during the Year 1888. *The Government Botanist.*

BALTIMORE—Johns Hopkins University. American Chemical Journal, Vol. x., Nos. 3, 4, 5, 6, 1888. American Journal of Mathematics, Vol. x. Nos. 3 and 4, 1888; Vol. xi., Nos. 1 and 2, 1888-9. American Journal of Philology, Vol. ix., Nos. 1, 2, 3, 1888. Studies from the Biological Laboratory, Vol. iv., Nos. 3 and 4. Studies in Historical and Political Science, Vol. vi., 1888, Seventh Series No. 1, 1889. University Circulars, Vol. vii., Nos. 65, 66, 67; Vol. viii., No. 68, 1888. *The University.*

BERLIN—K. Preuss. Akademie der Wissenschaften. Sitzungsberichte, Nos. 1—21, 1889. *The Academy.*

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BONN—Naturhistorischer Vereines der Preuss. Rheinlande, Westfalens und des Reg.-Bezirks Osnabrück. Verhandlungen, Jahrgang 45, Folge 5, Band 5, 1888; Jahrgang 46, Eolge 5, Band 6, 1889. *The Society.*

BOSTON (Mass.)—Boston Society of Natural History. Proceedings, Vol. XXIII., Parts iii. and iv., 1886-88. ,,

CAMBRIDGE (Mass.)—Museum of Comparative Zoölogy at Harvard College. Bulletin, Whole Series Vol. XVI., (Geological Series, Vol. II.) No. 5, 1889. *The Trustees.*

CINCINNATI—Cincinnati Society of Natural History. Journal Vol. XI., No. 4, 1889. *The Society.*

COPENHAGEN—Société Royale des Antiquaires du Nord. Mémoires, Nouvelle Série—1888. Tillœg til Aarboger for nordisk Oldkyndighed og Historie, Aargang 1887, 1888. ,,

EDINBURGH—Royal Physical Society. Proceedings, Vol. IX., Part iii., Session 1887-88. ,,

Royal Scottish Geographical Society. *The Scottish Geographical Magazine,"* Vol. v., No. 7, 1889. ,,

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GOTTINGEN—K. Gesellschaft der Wissenschaften und der Georg-Augusts-Universität zu Göttingen. Nachrichten, Nos. 1—17, 1888. ,,

HAMBURG—Deutsche Meteorologische Gesellschaft. *Meteorologische Zeitschrift*, July, 1889. ,,

HARLEM—Société Hollandaise des Sciences. Archives, Néerlandaises des Sciences Exactes et Naturelles, Tome XXIII., Livraisons 3 and 4, 1889. ,,

HOBART—Royal Society of Tasmania. Abstract of Proceedings, April 16, May 14, June 11, July 9, 1889. ,,

JENA—Medicinisch-Naturwissenschaftliche Gesellschaft. Jenaische Zeitschrift fur Naturwissenschaft, Band XXIII., N.F., Band XVI., Heft 2 and 3, 1889. ,,

LEEDS—Philosophical and Literary Society. Annual Report (69th) for 1888-9. ,,

LONDON—Anthropological Institute of Great Britain and Ireland. Journal, Vol. XVIII., No. 4, 1889. *The Institute.*

Linnean Society. Journal, Botany, Vol. XXV., No. 170, 1889. *The Society.*

Meteorological Office. Hourly Readings, Part iii., July to Septr. 1886, *Official No.* 81. Weekly Weather Report, Third Series, Vol. VI., Nos. 1—18, 1889. Quarterly Summary of the Weekly Weather Report, Jan.—March, 1889. Summary for the Calendar Month, Jan. 1889. *The Meteorological Council.*

Mineralogical Society. The Mineralogical Magazine and Journal of the Mineralogical Society, Vol. VIII., No. 39, May, 1889. *The Society.*

Apparatus for pulling the crank off the centre.

Fig. I.

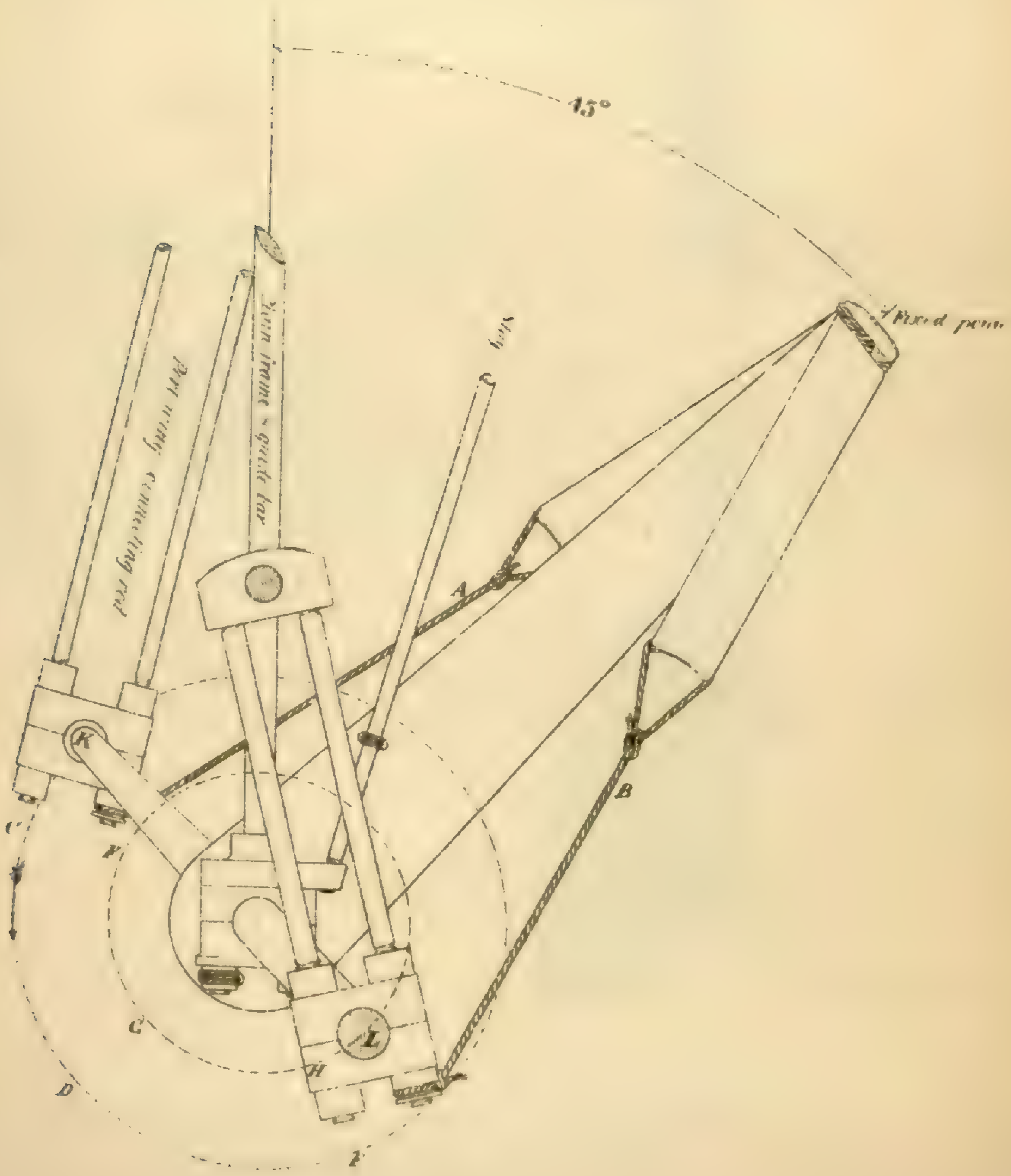
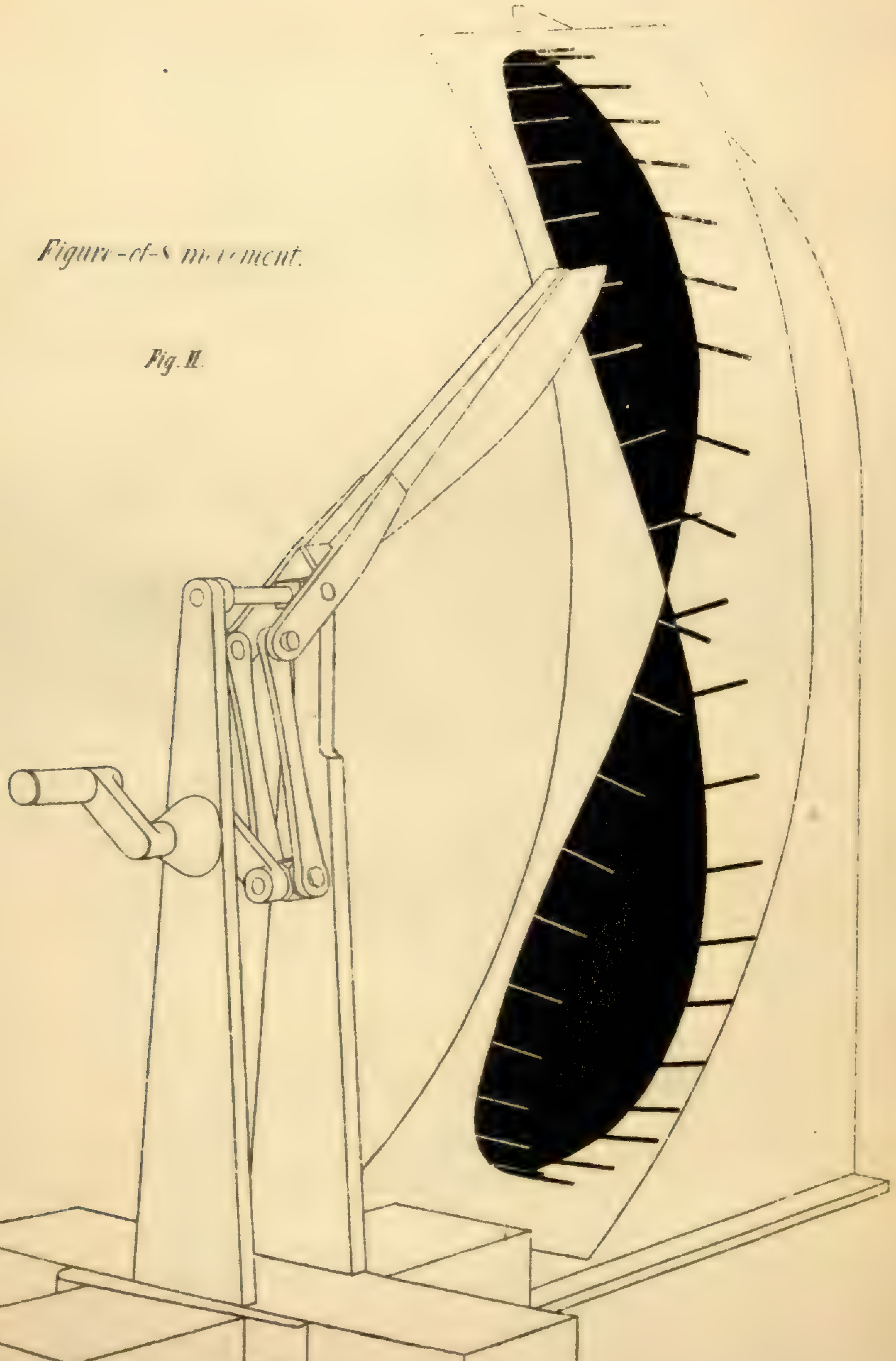
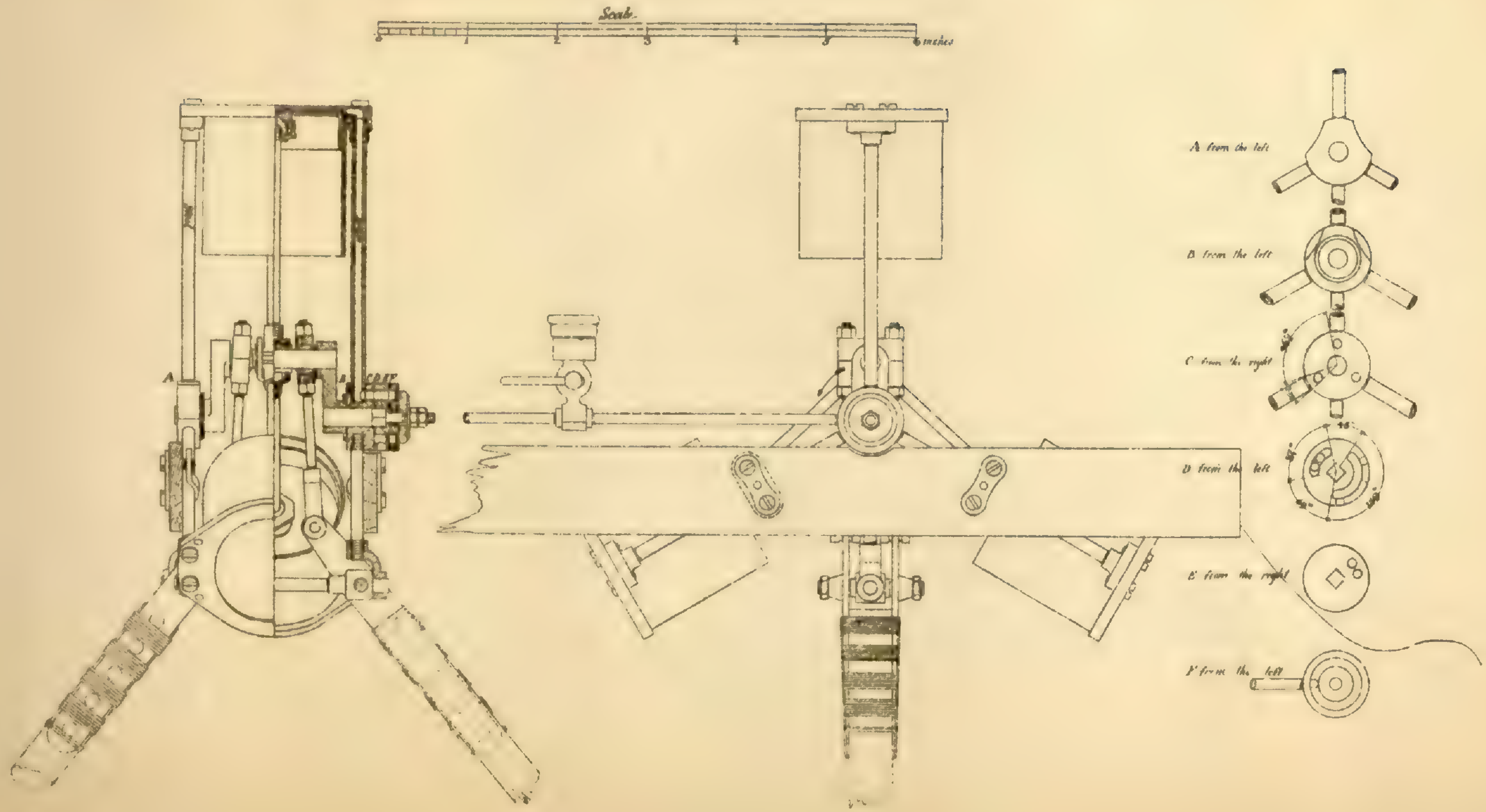


Figure-of-8 Movement.

Fig. II.

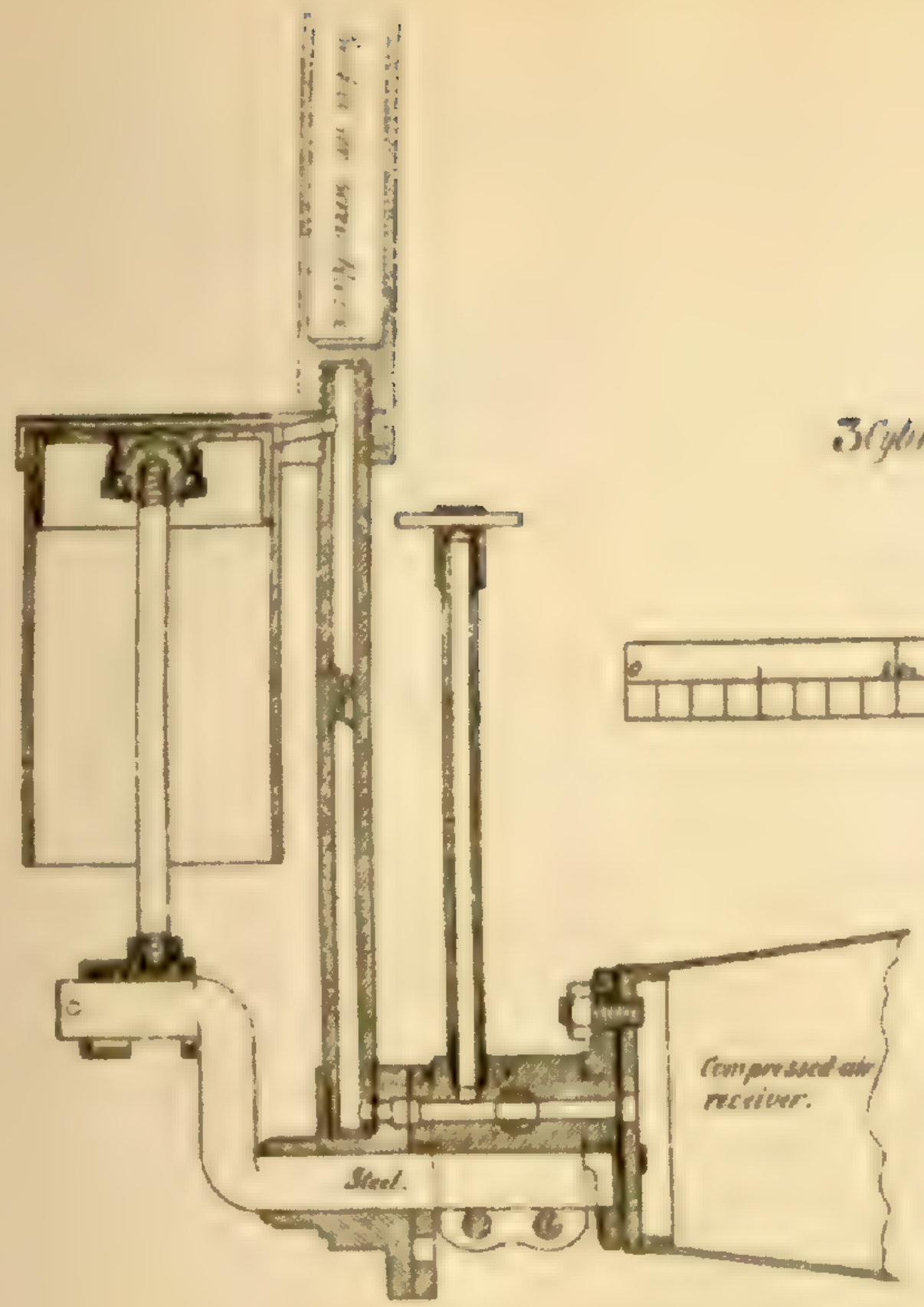


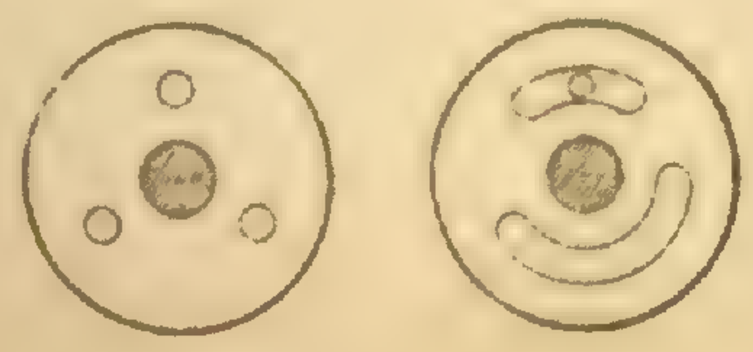
Engine for figure-of-eight flying-machine. *Fig. III.*

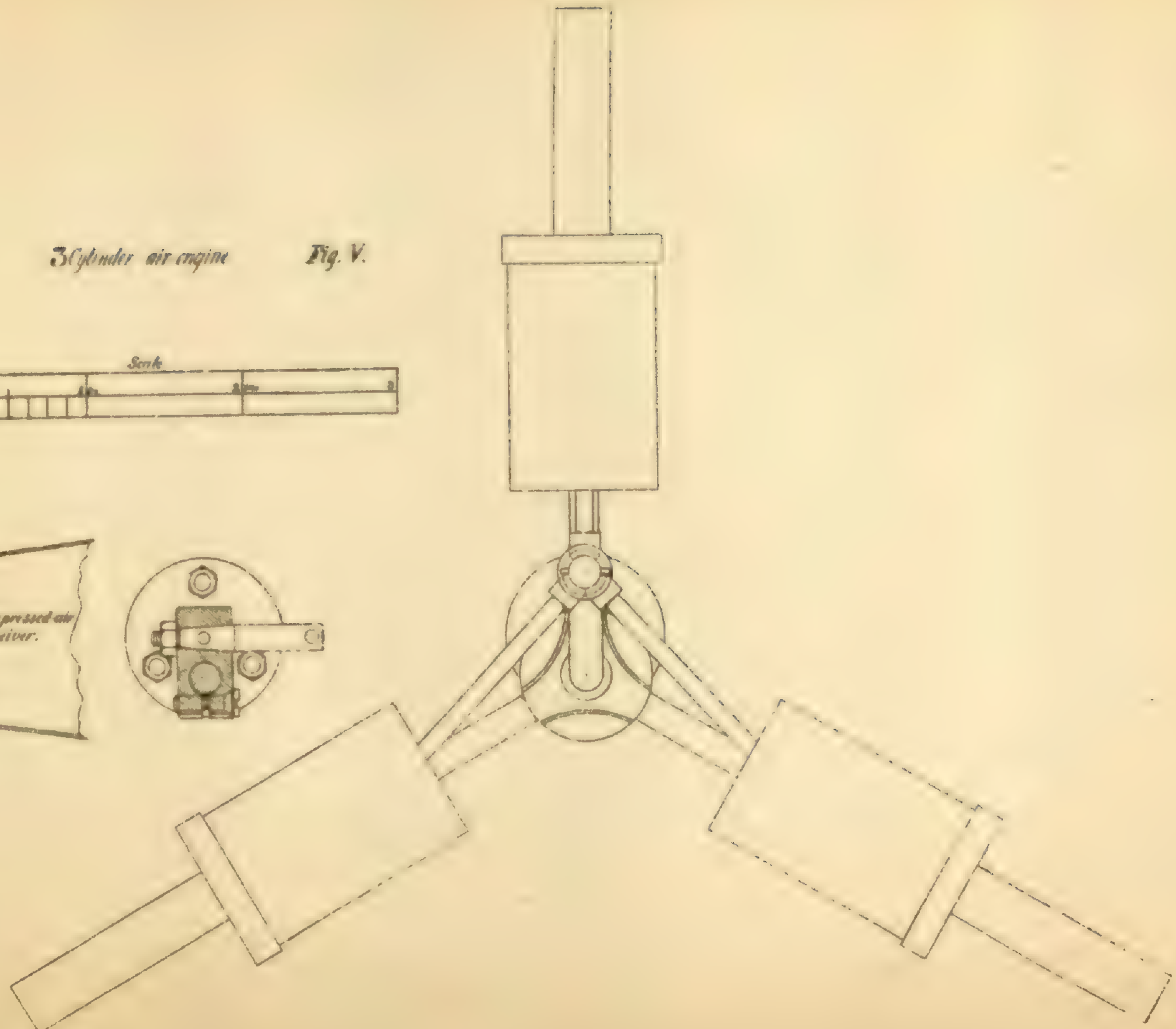


Journal Royal Society N.S.W. Vol. XXIII. Plate III.

3 Cylinder air engine Fig. V.







Stationary steam engine

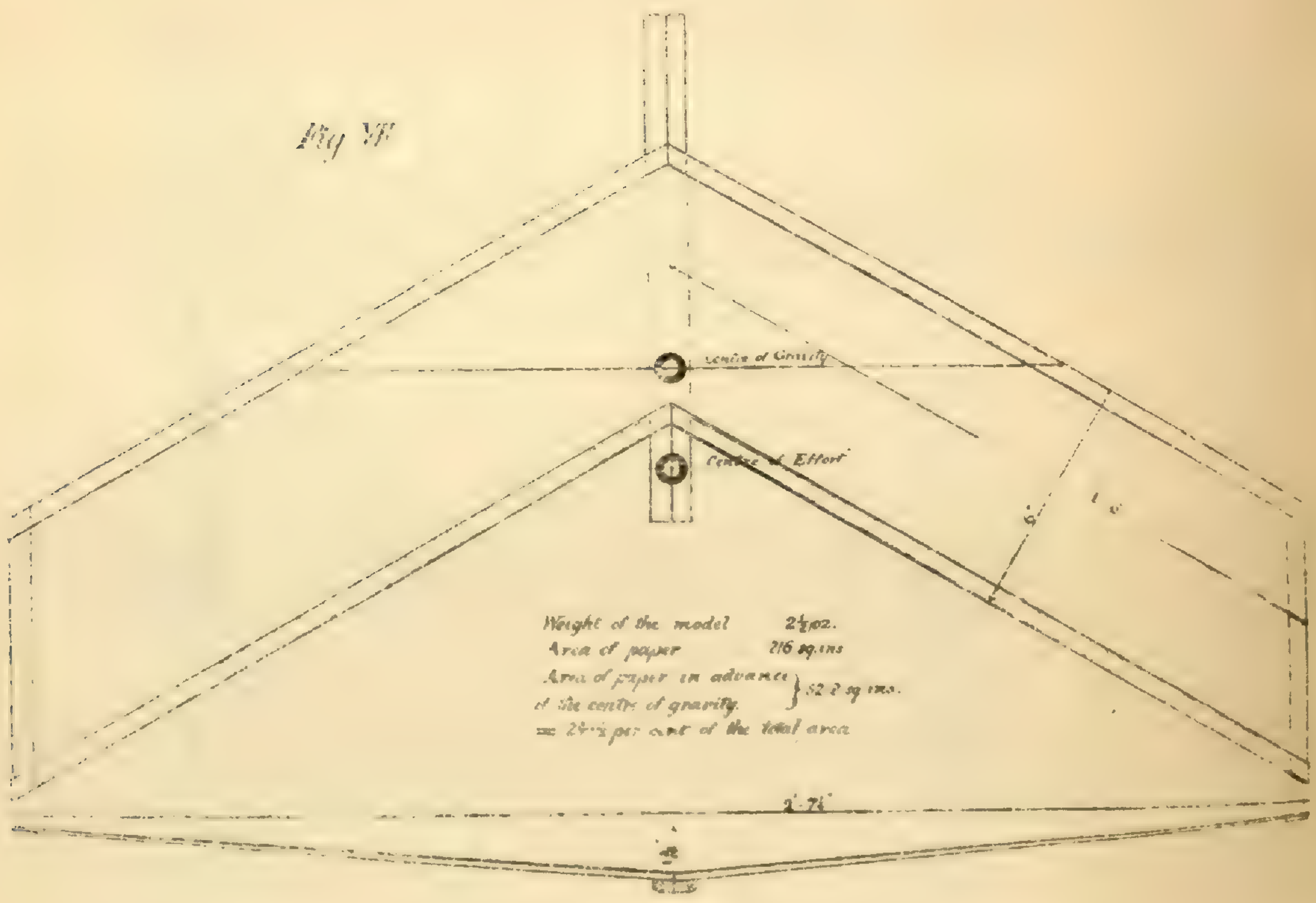
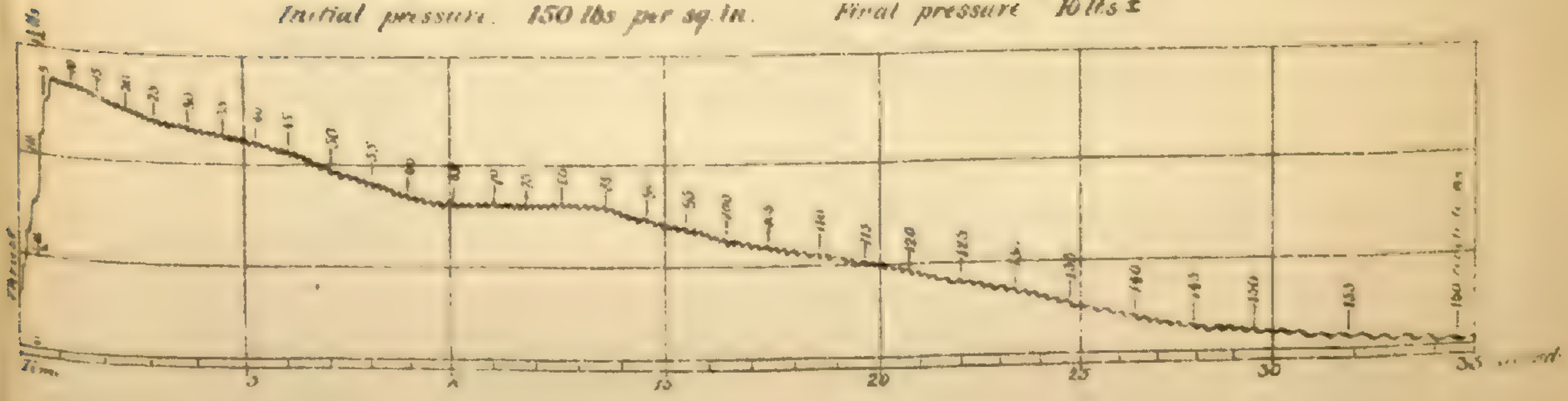


Fig. VI.

Diagram shewing the time, thrust and revolutions of the 3 cylinder screw engine

Receiver capacity ·18 cub. ft.

Initial pressure. 150 lbs per sq. in. *Final pressure* 10 lbs ±



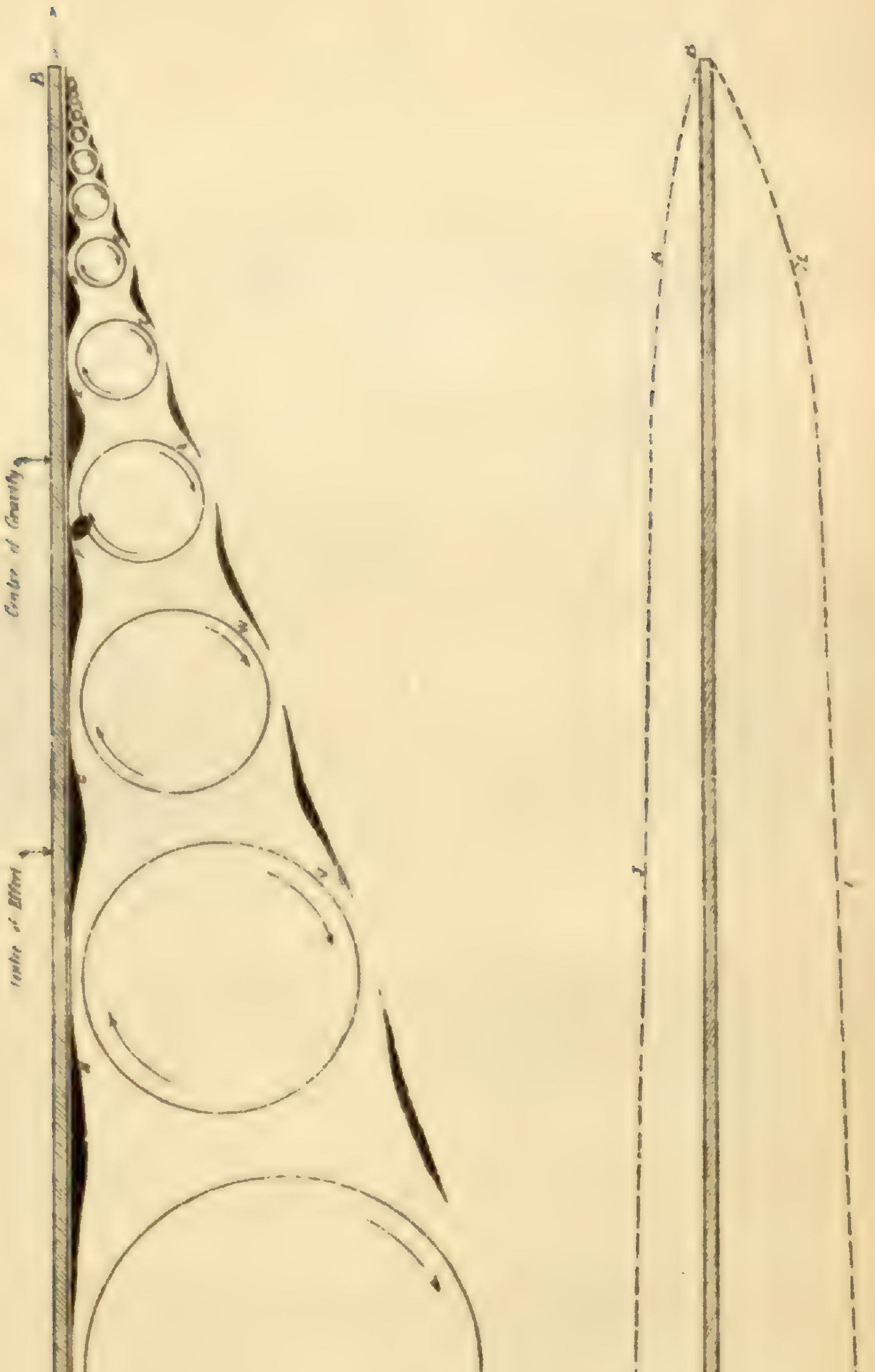


Fig. VII.

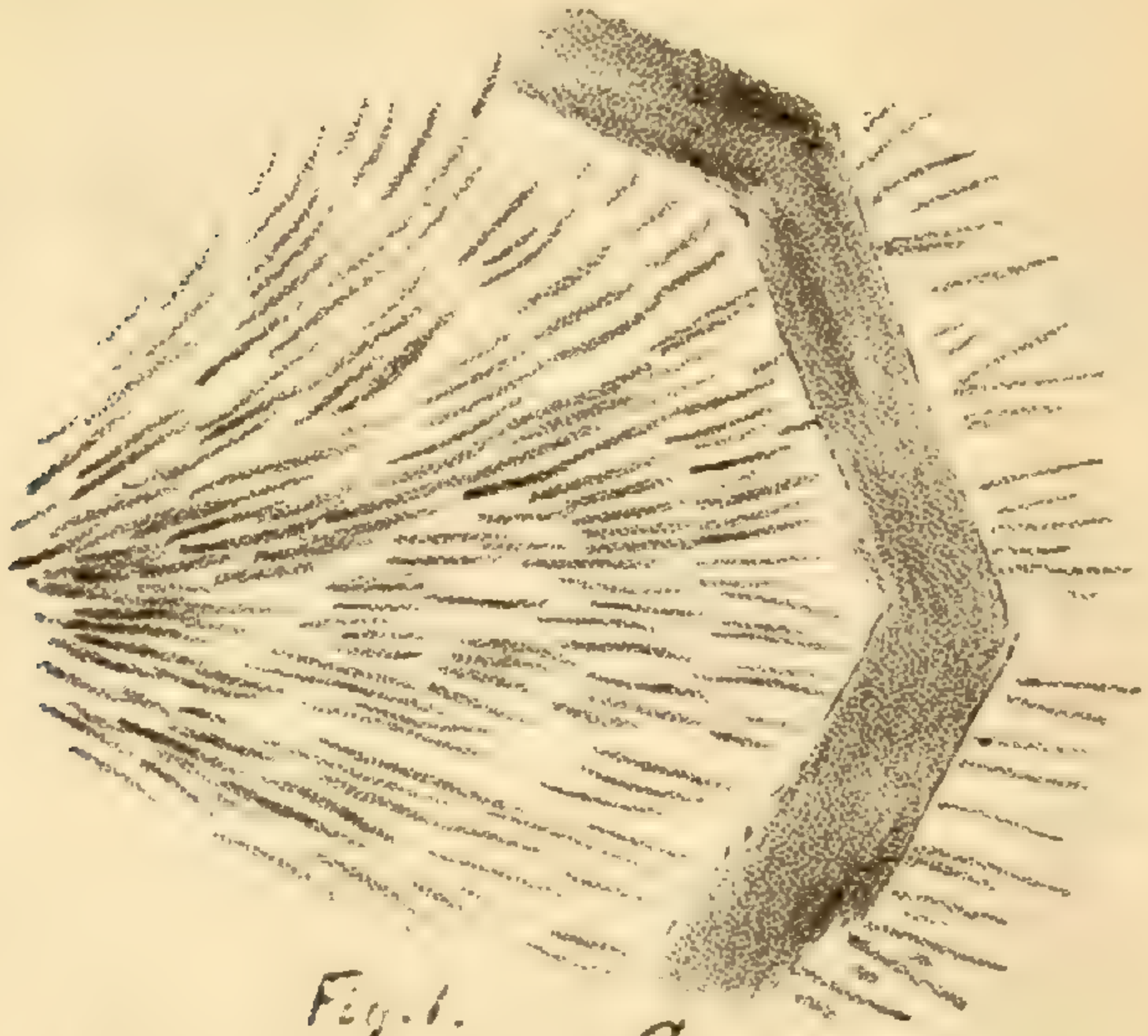


Fig. 1.

a

Fig. 2.

Fig. 3.

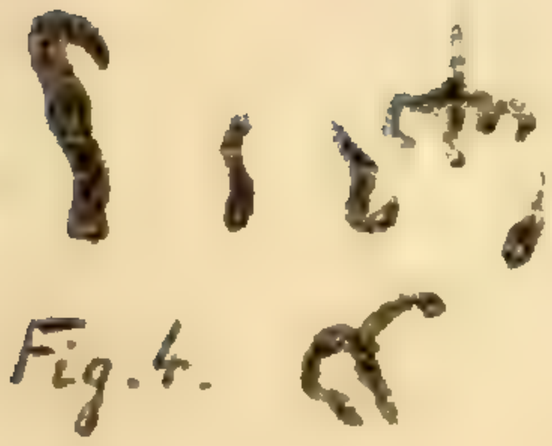


Fig. 4.

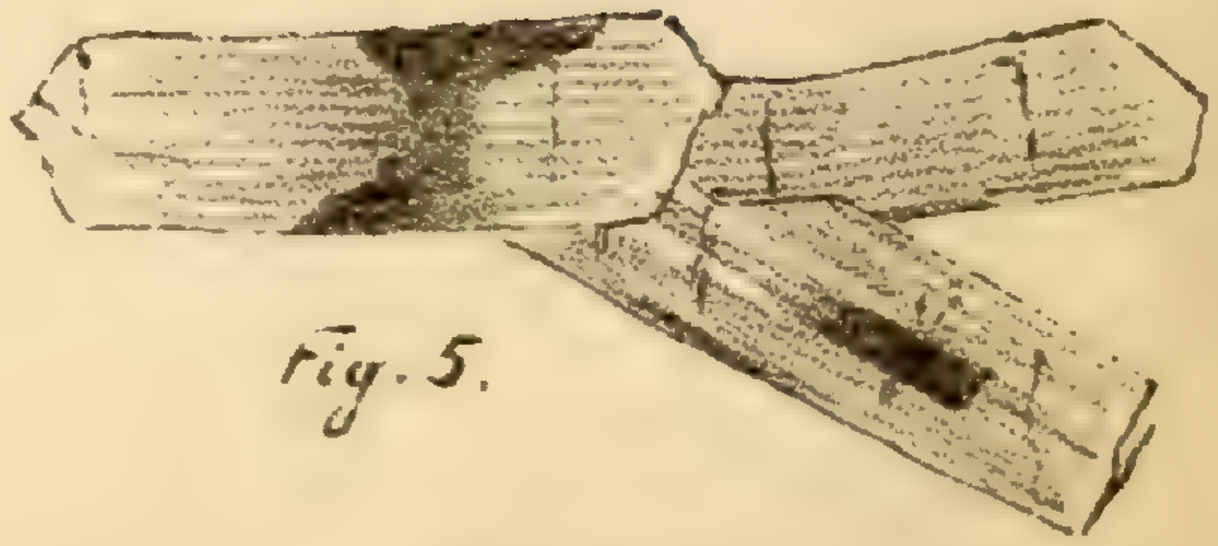


Fig. 5.

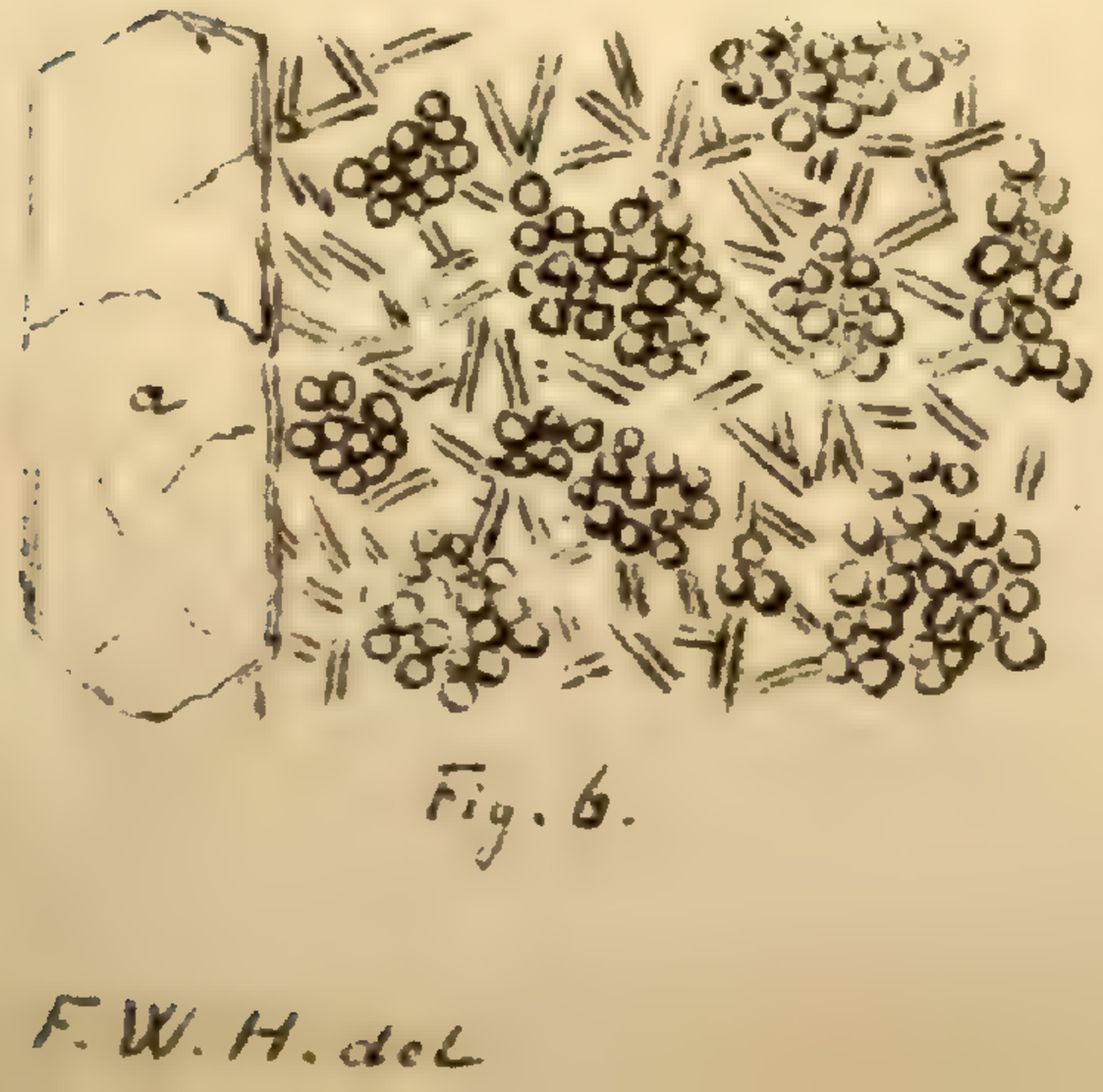


Fig. 6.

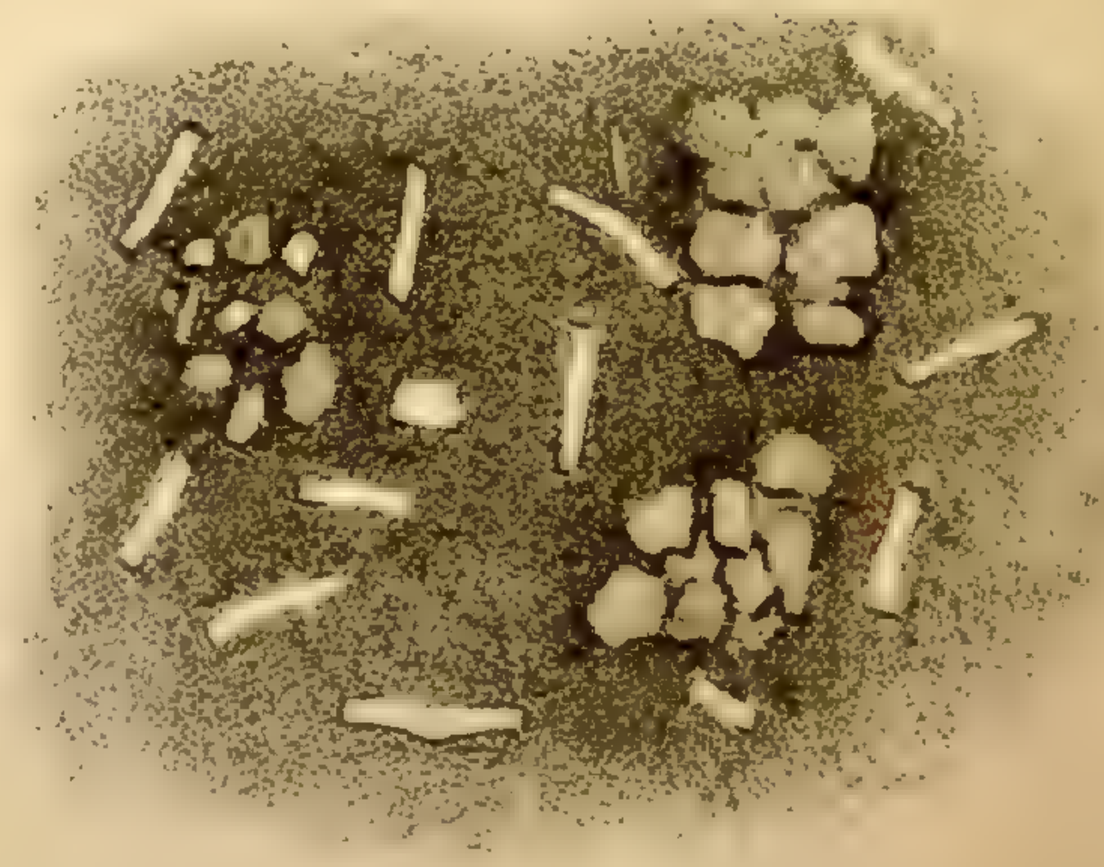


Fig. 7.

F. W. H. del.

(N° of Lith. D.89-19)

To accompany paper on "Irrigation in its relation to the Pastoral Industry" read before the Royal Society by Mr. H.C. McKinney on the 4th September 1889.

MAP of NEW SOUTH WALES

shewing

PASTORAL AND AGRICULTURAL AREAS
STOCK ROUTES, WELLS, TANKS AND TRUCKING STATIONS
RAILWAYS AND TELEGRAPH LINES
ALSO TERRITORIAL DIVISIONS

1888.

Scale of Statute Miles

Proposed Territorial Areas in the Central and Western Divisions

Territorial Boundaries for purposes of C.L.A. Act 1884 shewn thus — INGLIS

County Boundaries and Names do.

Pastoral Area shewn by Green tint thus

Agricultural Area shewn by Red tint do.

Travelling Stock Routes shewn thus T. S. R. 1416

Stock Trucking Stations do.

Tanks and Wells (existing) do. ■ Tank ● Well

do. do. (proposed & in course of construction) do. □ Tank ○ Well

Existing Railways and those in course of construction do.

Telegraph Lines do.

Printed at the Department of Lands, Sydney, N.S.W., October 1889

Victorian Water Supply

PLAN

Shewing TRUSTS CONSTITUTED and PROPOSED under WATER CONSERVATION and IRRIGATION ACT, TOWNS SUPPLIED under LOCAL GOVERNING BODIES LOAN ACT and WORKS CONSTRUCTED and PROPOSED by the VICTORIAN WATER SUPPLY DEPARTMENT to 31/7/89.

REFERENCE

WATERWORKS TRUSTS SHEWN BY BLUE COLOR	THUS
URBAN DISTRICTS SHEWN BY BLUE CIRCLE	"
PROPOSED URBAN DISTRICTS SHEWN BY BLUE CIRCLE	"
IRRIGATION TRUSTS SHEWN BY RED COLOR	"
PROPOSED IRRIGATION TRUSTS SHEWN BY HATCHED RED LINES	"
TOWNS SUPPLIED UNDER LOCAL GOVERNING BODIES LOAN ACT SHEWN BY RED CIRCLE	"
TOWNS SUPPLIED BY DEPARTMENTAL WORKS SHEWN BY BLACK CIRCLE	"
NATIONAL WORKS (PROPOSED AND IN COURSE OF CONSTRUCTION) SHEWN IN	"

VICTORIA

STUART MURRAY,
Chief Engineer of Water Supply.

201/8/89.

Scale of Statute Miles

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Secretaries .. Dr. MacCormick and Dr. Jenkins.
Committee... Dr. P. Sydney Jones, Dr. W. H. Goode, Dr. E. Fairfax Ross, Dr. W. Chisholm, Dr. Alfred Shewin, Dr. Knaggs.

Meetings held on the Third Friday in each month, at 8·15 p.m.

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Committee... H. G. A. Wright, M.R.C.S.E., A. P. Bedford, T. Brindley, and T. Whitelegge.

Meetings held on the Second Monday in each month at 8 p.m.

GENERAL MONTHLY MEETINGS.

	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
WEDNESDAY, (8 p.m.) ...	1	5	3	7	4	2	6	4

SECTION MEETINGS.

	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
MEDICAL—Friday, (8·15 p.m.) ...	17	21	19	16	20	18	15	20
MICROSCOPY—Monday (8 p.m.) ...	13	10	8	12	9	14	11	9

Vol. XXIII. 1889. Part II.

JOURNAL & PROCEEDINGS

OF THE

ROYAL SOCIETY

OF

NEW SOUTH WALES,

EDITED BY

THE HONORARY SECRETARIES.

CONTENTS.

PAGE

List of the Marine and Fresh-water Invertebrate Fauna of Port Jackson and the Neighbourhood. By Thomas Whitelegge, F.R.M.S. 163
The Analysis of the Prickly Pear. By W. M. Hamlet, F.C.S., F.I.C., Government Analyst 324
On the occurrence of Arabin in the Prickly Pear, (*Opuntia Braziliensis*). By W. M. Hamlet, F.C.S., F.I.C., Government Analyst 325
Notes on some New South Wales Minerals. By C. H. Mingaye, F.C.S. 326
Notes on Goulburn Lime. By E. C. Manfred 328
The Australian Aborigines. By Rev. John Mathew, M.A., Coburg, Victoria (With Plate and Map) 335
Aids to Sanitation in Unsewered Districts: (Poudrette Factories.) By J. Ashburton Thompson, M.D., D.P.H., Chief Medical Inspector, Health Department, Government of New South Wales 450
Well and River Waters of New South Wales. By W. A. Dixon, F.I.C., F.C.S., Lecturer on Chemistry, Sydney Technical College 465
The Aborigines of Australia, being personal recollections of those tribes which once inhabited the Adelaide Plains of South Australia. By Edward Stephens, Bangor, Tasmania 476
New South Wales as a Health Resort in Phthisis Pulmonalis. By Dr. Bernard James Newmarch. (Read before the Medical Section) 503
Lecture—The present state of applied Electrical Science. By Prof. Threlfall, M.A. 511
„ The Evolution of the Kerosene Lamp. By W. M. Hamlet, F.C.S., F.I.C. 511
Reception of the Members to the Royal Society of New South Wales 157
Proceedings, Donations, &c. 330, 511
„ of the Sections—Medical Section 521
„ „ Microscopical Section 522
Title Page, Contents, Office-bearers, Additions to the Library, Index to Volume XXIII., Exchanges and Presentations, and Rainfall Map of New South Wales during 1889, by H. C. Russell, B.A., F.R.S.

THE AUTHORS OF PAPERS ARE ALONE RESPONSIBLE FOR THE OPINIONS EXPRESSED THEREIN.

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LONDON—Royal Astronomical Society. Monthly Notices, Vol. XLIX., No. 7, May, 1889. *The Society.*

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LIST OF THE MARINE AND FRESH-WATER INVERTEBRATE FAUNA OF PORT JACKSON AND THE NEIGHBOURHOOD.

By THOMAS WHITELEGGE, F.R.M.S.

[*Read before the Royal Society of N.S.W., July 3, 1889.*]

THE following list, although in the main a compilation, contains the result of some years observation and research. The subject is a wide one and almost too much for any one person to accomplish single handed, however I have attempted to bring together all that is known in reference to our somewhat neglected invertebrate fauna, and in doing so I have made use of all the published matter relating thereto that I have been able to collect together. Owing to the scattered nature of the literature and a scarcity of books bearing on the subject, this has been no easy task. In most cases I have, when possible, consulted the original works for references, but in many instances, the quotations are second hand from the fact that the books are not in the colony. Especial pains have been taken to verify and check the references to render them reliable. The greatest difficulty I have had to contend with, has been the want of works of reference and the amount of unworked

material, which had to be examined before I could proceed, and I may say that the greater part of my time has been spent in working out species, many of them very common but never hitherto determined.

The Foraminifera, Infusoria, Alcyonaria, Actinidæ, Hydroida, Echinodermata and Polyzoa in the Marine part, and the Rhizopoda, Infusoria, and Rotifera in the Fresh-water portion of this list will, if attentively examined, show to some extent the amount of work accomplished in this direction. Besides the unworked material, there were a large number of described species recorded as occurring in Port Jackson, but they have not been observed since their original discovery. As regards these I have made strict search in likely localities, and in many cases was successful in finding species obtained by some of the early naturalists who visited our coast. I have also made many special journeys, so as to be enabled to give a definite habitat for some of the more interesting species.

The classification generally followed in the arrangement of the subject is that given in Claus and Sedgwick's Text Book of Zoology, and in the various classes I have taken as near as possible, that used by acknowledged authorities or specialists in each branch. After each species enumerated there follows one or more references to the book or paper in which a description may be found, with the number of the volume, page, plate, figure and the habitat or locality where each species may be obtained.

The Foraminifera are well represented in our waters by 127 species, and from what I have seen I believe there are still large additions to be made in this very interesting field of observation.

The Radiolaria are few in number and comparatively rare, I have seen about four species, obtained in the tow net near the Heads.

Our Marine Infusorian fauna appears to have been wholly overlooked in that I have failed thus far to find any papers dealing with them, and the few mentioned in this list are what I have seen when examining other objects. Seven species are herein recorded.

The Sponge Fauna of Port Jackson has had a considerable amount of attention, and the results are to be found in the Catalogue of Sponges in the Australian Museum, by Dr. R. von Lendenfeld, in the various Challenger Reports by Polejaeff, Vosmaer, Messrs. Ridley and Dendy, and in the Zoology of the "Alert" by S. O. Ridley. Most of the Sponges in the Australian Museum have been obtained through the liberality of the trustees of that Institution, who have provided funds for systematic dredging and trawling for many years past. These operations under the able direction of Dr. Ramsay, the Curator, have yielded valuable

results, not only in sponges, but in many other branches of marine zoology, and great credit is due to Dr. Ramsay for his efforts in this direction, the material collected by him having provided a rich field of investigation to Dr. Lendenfeld.

The Alcyonarian corals, embracing the Gorgonias and Pennatulas are fairly represented, 29 species being enumerated. What little has been done in this order is however very scattered and fragmentary, and the descriptions are imperfect in most instances thereby rendering identification very difficult. The same remarks apply to the Actinidæ, so far I have only seen the descriptions of four species, and great difficulty was met with in dealing with this section ; a list of 10 species is given, but I believe we have some 20 species readily obtainable.

The corals have been mostly worked out by the late Rev. J. E. Tenison-Woods, and considering our geographical position, muster very fairly with 13 species, which will, no doubt, be largely added to when systematic dredging is carried on in deep water outside the harbour. *Plesiastraea Urvillei* and *Cylicia quinaria* may be said to be fairly common in many parts of Port Jackson, whilst the rest are rare, and only met with occasionally.

The Hydroid Zoophytes have been dealt with by Mr. Bale and Dr. Lendenfeld in publications issued by the Australian Museum, and there is still room for more workers in this very interesting group. During 1886 I devoted a few weeks to collecting Hydroids with highly satisfactory results ; amongst those collected were 12 new species besides some additions to the known fauna. Quite recently, I found about seven species new to our coast, and six or seven new to science ; this shows that in a field, comparatively speaking well worked, there is still a vast amount of investigation to be done.

The Siphonophora, including the Velella and Portuguese Men of War are represented by seven species ; the Scyphomedusæ, to which order the Jelly-fish belong, by seven species and the Ctenophora, by two species.

The Crinoidea or feather stars are not very numerous, five species only being known from Port Jackson, two of which are common. The Ophiuroidea are well represented by 35 species, many of them being fairly common under stones in various parts of the harbour.

The Asteroidea number 30 species, and amongst them are many very interesting forms, one in particular being remarkable, in that it inhabits the zone between high and low water mark, and is never seen below ordinary low tide line. Moreover, there is an exceptional phase in the development of the young, for the eggs are deposited under stones in little rock pools and the young when hatched out never leave the spot until they assume the adult form,

thus offering a fit subject for study to the student, in which the various stages of development can be easily observed and specimens may be obtained in abundance for at least eight months in the year.

The Echinoidea are represented by 29 species, a few being confined to Port Jackson, five may be said to be fairly common, and the rest are more or less rare. For our knowledge of the Echini we are indebted to the late Rev. J. E. Tenison-Woods and Dr. E. P. Ramsay. The Holothurioidea have only been partially worked, and it is probable that there are many more species than the 16 herein mentioned.

The Marine Worms have been partly dealt with by Dr. Haswell, but there remains a vast amount of work still to be done in this somewhat neglected class. I have to thank him for much valuable information relating to the fauna of Port Jackson generally, and the worms in particular, also for his having kindly revised the MS. and at the same time added many species to the list.

The Crustacea have also been worked out by Dr. Haswell in a catalogue published by the Trustees of the Australian Museum; since this was issued there has been a considerable number of additions made chiefly through the collections of the "Challenger" and of the "Alert," together with some few added by myself. The lower orders of the class have been dealt with by the authors of the various Challenger Reports and the total number of species now recorded is 367. To Dr. Haswell, indebtedness is due for information respecting the Pycnogonida or sea-spiders, four out of the six species mentioned having been described by him in the Linnean Proceedings; and I desire to thank Mr. A. S. Olliff and Mr. F. E. Skuse for the marine insects mentioned.

The Mollusca appear to have had more attention paid to them than any of the other invertebrates. It would have been almost impossible for me to have done justice to this section, had I not had the assistance of Mr. John Brazier of the Australian Museum, who has afforded very great help in the way of books and papers, as well as in allowing me to use his notes relating to synonyms, habitats, &c., in addition to which my thanks are due to him for his kindness in undertaking the revision of the list of shells, and for information regarding many other branches of marine zoology.

The Molluscoidea are fairly represented, but there still remains much to be done in this group. The Polyzoa have to a great extent been worked out by Mr. A. W. Waters, chiefly from material collected by Mr. Brazier.

The Tunicata are not well represented considering the number of forms to be seen on our rocky shores. The species enumerated are taken chiefly from the list contained in the "Voyage of the Challenger," by Prof. Herdman, who has in hand a large collection

from Port Jackson, the detailed description of which will, when published, no doubt add largely to the number of species.

The freshwater fauna is not very well represented, the Rhizopoda, Infusoria, and Rotifera are only in part worked out, and there are very many more species with which I am acquainted but have not had time to investigate sufficiently to include them in this list. Beyond a few exhibits recorded in the Proceedings of the Royal and Linnean Societies of New South Wales, there has been little or nothing done in regard to the above mentioned classes, and most of those recorded have been worked out by myself for this paper. The Planarians, Oligochaeta, and other classes of worms are practically untouched, and would well repay investigation. The Entomostraca have been dealt with by the Rev. R. L. King, but since his papers were published little has been done. Mr. G. S. Brady has described some from the Tweed River district in the Proceedings of the Zoological Society, and Prof. Sars of Christiana has also described some from New South Wales and Queensland, the species having been raised in an aquarium from dried mud sent from Australia to Prof. Sars in Norway by one of his correspondents. The Mollusca are not very numerous, no doubt there are many more species to be found near Sydney, and I must again thank Mr. Brazier for his kindness in supplying me with books, notes, and many of the habitats herein recorded.

In conclusion, I desire to say that it has been my best endeavour to render this list as complete as possible, and if any grave mistakes have been made in assigning species to wrong genera or families, I venture to hope that specialists will overlook such, since it is no easy task to make a compilation from so many different authors.

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Arch. f. Natur., Archiv fur Naturgeschichte, Berlin.

Arch. Zool. Exp., Archives de Zoologie Experimentale et Generale, Paris, 1871-1889.

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Cat. Hydroida, Catalogue of the Australian Hydroid Zoophytes, W. M. Bale, 1884.

Cat. Medusæ, Catalogue of the Medusæ of the Australian Seas, Part i. Scyphomedusæ, Part ii. Hydromedusæ, Dr. R. v. Lendenfeld, 1887.

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Conch. Cab., Conchylien Cabinet, Martini and Chemnitz.

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Part I. Marine Invertebrates.

Sub-Kingdom PROTOZOA.

Class RHIZOPODA.

Order I. FORAMINIFERA.

Family NUBECULARINÆ.

Sub-Family Miliolininæ.

1 Biloculina comata, Brady; Challenger Report, Foraminifera, Vol. ix., p. 144, pl. iii., f. 9, *a-b*. 410 Faths. Station, 164 A. Off Port Jackson.
2 B. depressa, (d'Orb.); C.R., p. 145, pl. ii., f. 12; 15-17, pl. iii., f. 1, 2. Off P.J.
3 B. ringens, (Lam.); C.R., p. 142, pl. ii., f. 7, 8. Off P.J.
4 Spiroloculina limbata, (d'Orb.); C.R., p. 150, pl. ix., f. 15-17. Off P.J.
5 S. tenuis, (Czizek); C.R., p. 152, pl. x., f. 7-11. Off P.J.
6 S. impressa, Tarquem; C.R., p. 151, pl. x., f. 3, 4. Watson's Bay, (W.)
7 S. grata, Tarquem; C.R., p. 155, pl. x., f. 16, 17, 22, 23. Watson's Bay.
8 Miolina semilulum, Linné; C.R., p. 157, pl. v., f. 6, *a. b. c.* Off P.J.
9 M. oblongum, Montagu; C.R., p. 160, pl. v., f. 4, *a. b.* Watson's Bay, (W.), off P.J.
10 M. tricarinata, d'Orb.; C.R., p. 165, pl. iii., f. 17, *a.b.* Watson's Bay, (W.), off P.J.
11 M. circularis, Bornemann; C.R., p. 169, pl. iv., f. 3, *a. b. c.*; pl. v., f. 13, 14? Watson's Bay, (W.)
12 M. agglutinans, d'Orb.; C.R., p. 180, pl. viii., f. 6, 7. Off P.J.
13 M. crassatina, Brady; C.R., p. 180, pl. viii., f. 5, *a. b.* Watson's Bay, (W.)

Sub-Family Hauerininæ.

14 Ophthalmidium inconstans, Brady; C.R., p. 189, pl. xii., f. 5, 7, 8. Off P.J.

Sub-Family Peneroplidinæ.

15 Peneroplis pertusus, Forskal; C.R., p. 204, pl. xiii., figs. 12 – 25. Very common, Watson's Bay, (W.)

Family ASTRORHIZIDÆ.

Sub-Family Pilulininæ.

16 Technitella legumen, Norman; C.R., p. 246, pl. xxv., f. 8-12. Off P.J.

Sub-Family Rhabdammininæ.

17 Hyperammina elongata, Brady ; C.R., p. 257, pl. xxiii., f. 4, 7-10. Off P.J.
18 H. ramosa, Brady, C.R., p. 261, pl. 23, f. 15-19. Off P.J.
19 Rhabdammina abyssorum, Sars ; C.R., p. 266, pl. xxi., f. 1-13. Off P.J.
20 Haliphysema ramulosum, Bowerbank ; C.R., p. 283, pl. xxvii. A. f. 6. This species is abundant on shells and stones in many parts of Port Jackson, at low water mark. Middle Harbour, Farm Cove, Watson's Bay, (W.)

Family LITUOLIDÆ.

Sub-Family Lituolinæ.

21 Reophax difflugiformis, Brady ; p. 289, pl. xxx., f. 1-5. Off P.J.
22 R. scorpiurus, Montfort ;? C.R., p. 291, pl. xxx., f. 12-17. Watson's Bay, (W.)
23 R. pilulifa, Brady ; C.R., p. 292, pl. xxx., f. 18-20. Off P.J.
24 R. nodulosa, Brady ; C.R., p. 294, pl. xxxi., f. 1-9. Watson's Bay, (W.)
25 Haplophragmium calcareum, Brady; C.R., p. 302, pl. xxxiii., f. 5-12. Off P.J.
26 H. globigeriniforme, Parker & Jones; C.R., p. 313, pl. xxxv., f. 10, 11. Off P.J.

Sub-Family Trochammininæ.

27 Ammodiscus gordialis, Jones & Parker ; C.R., p. 333, pl. xxxviii., f. 7-9.
28 Trochammina proteus, Karrer ; C.R., p. 341, pl. xl., f. 1-3. Off P.J.
29 Webbinia clavata, Jones & Parker ; C.R., p. 349, pl. xli., f. 12-16. Off P.J.

Family TEXTULARIDÆ.

Sub-Family Textularidæ.

30 Textularia agglutinans, d'Orb. ; C.R., p. 363, pl. xliii, f. 1-3. Watson's Bay, (W.), off P.J.
31 T. leucolenta, Brady; C.R., p. 364, pl. lxiii., f. 5-8. Off P.J.
32 Gaudryina pupoides, d'Orb. ; C.R., p. 378, pl. xlvi., f. 1-4. Watson's Bay (W), off P.J.
33 Valvulina fusca, Will. ; C.R., p. 392, pl. xlix., f. 13, 14. Off P.J.

Sub-Family Buliminınæ.

34 Bulimina elegantissima, d'Orb. ; C.R., p. 402, pl. l., f. 20-22. Watson's Bay (W) off P.J.

35 B. BUCHIANA, d'Orb.; C.R., p. 407, pl. li., f. 18, 19. Off P.J.
36 B. WILLIAMSONIANA, Brady ; C.R., p. 408, pl. li., f. 16-17. Watson's Bay (W), off P.J.
37 B. CONTRARIA, Reuss; C.R., p. 409, pl. liv., f. 18, *a.b.c.* Off P.J.
38 B. ACULEATA, d'Orb. ; C.R., p. 406, pl. li., f. 7-9. Watson's Bay (W.), off P.J.
39 B. PUPOIDES, d'Orb. ; C.R., p. 400, pl. l., f. 15, *a. b.* Off P.J.
40 B. PYRULA, d'Orb.; C.R., p. 399, pl. l., f. 7-10. Off P.J.
41 B. SUBTERES, Brady ; C.R., p. 403, pl. l., f. 17, 18.
42 BOLIVINA ROBUSTA, Brady ; C.R., p. 421, pl. liii., f. 7-9. Watson's Bay (W), off P.J.
43 B. BEYRICHI, Reuss ; C.R., p. 422, pl. liii., f. 1. Watson's Bay (W.), off P.J.

Sub-Family CASSIDULININÆ.

44 CASSIDULINA CRASSA, d'Orb. ; C.R., p. 429, pl. liv., f. 4, 5. Off P.J.
45 C. LAEVIGATA, d'Orb.; C.R., p. 428, pl. liv., f. 1-3. Off P.J.
46 C. SUBGLOBOSA, Brady ; C.R., p. 430, pl. liv., f. 17, *a.b.c.* Off P.J.
47 C. BRADYI, Norman , C.R., p. 431, pl. liv., f. 6-10. Off P.J.
48 EHREMBERGINA SERRATA, Reuss ; C.R., p. 434, pl. lv., f. 2-7. Watson's Bay (W.), off P.J.

Family CHILOSTOMELLIDÆ.

49 CHILOSTOMELLA OVOIDA, Reuss ; C.R., p. 436, pl. lv., f. 12-23. Watson's Bay (W.), off P.J.

Family LAGENIDÆ.

Sub-Family LAGENINÆ.

50 LAGENA ACUTA, Reuss ; C.R., p. 474, pl. lxix., f. 6, *a.b.c.* Watson's Bay (W.), off P.J.
51 L. GLOBOSA, Montagu ; C.R., p. 452, pl. lvi., f. 1, 2, 3. Watson's Bay (W.), off P.J.
52 L. LAEVIS, Montagu ; C.R., p. 455, pl. lvi., f. 7-14, 30. Watson's Bay (W.), off P.J.
53 L. ELONGATA, Ehrenberg ; C.R., p. 457, pl. lvi., f. 29. Watson's Bay (W.), off P.J.
54 L. GRACILLIMA, Seguenza ; C.R., p. 456, pl. lvi., f. 19-28. Watson's Bay (W.), off P.J.
55 L. STRIATA, d'Orb. ; C.R., p. 460, pl. lvii., f. 22, 24, 28, 29. Watson's Bay (W), off P.J.
56 L. LINEATA, Williamson; C.R., p. 461, pl. lvii., f. 13. Watson's Bay (W.).
57 L. SULCATA, Walker & Jacob ; C.R., p. 462, pl. lvii., f. 23, 26, 33, 34. Watson's Bay (W.), off P.J.

58 L. ACUTICOSTA, Reuss; C.R., p. 464, pl. lvii., f. 33-32; pl. lviii. f. 20 ? 21. Watson's Bay (W.)
59 L. SEMISTRIATA, Williamson; C.R., p. 465, pl. lvii., f. 14, 16, 17. Watson's Bay (W.), off P.J.
60 L. CRENATA, Parker & Jones; C.R., p. 467, pl. lvii., f. 15, 21. Watson's Bay (W.), off P.J.
61 L. SPIRALIS, Brady; C.R., p. 468, pl. cxvi., f. 9. Watson's Bay (W.).
62 L. STRIATOPUNCTATA, Parker & Jones, C.R., p. 469, pl. lviii., f. 37-40. Watson's Bay (W.), off P.J.
63 L. FEILDENIANA, Brady; C.R., p. 469, pl. lviii., f. 38, 39. Off P.J.
64 L. SQUAMOSA, Montagu; C.R., p. 471, pl. lviii., f. 28-31. Watson's Bay (W.).
65 L. HEXAGONA, Williamson; C.R., p. 472, pl. lviii., f. 32-33. Watson's Bay (W.), off P.J.
66 L. MARGINATA, Walker & Boys; C.R., p. 476, pl. lix., f. 21-23. Watson's Bay (W.), off P.J.
67 L. LAGENOIDES, Williamson; C.R., p. 479, pl. lx., f. 6, 7, 9, 12-14. Watson's Bay (W.), off P.J.
68 L. QUADRICOSTULATA, Reuss; C.R., p. 386, pl. lix., f. 15. Watson's Bay (W.), off P.J.
69 L. ORBIGNYANA, Seguenza; C.R., p. 484, pl. lix., f. 1, 18, 24 26. Watson's Bay (W.), off P.J.
70 L. PLUMIGERA, Brady; C.R., p. 465, pl. lviii., f. 25, 27. Watson's Bay (W.).
71 L. APICULATA, Reuss; C.R., p 453, pl. lvi., f. 4, 15-18. Watson's Bay (W.).

Sub-Family NODOSARINÆ.

72 NODOSARIA LAEVIGATA, d'Orb.; C.R., p. 493, pl. lxi. f. 21, 22. Off P.J.
73 N. SOLUTA, Reuss; C.R., p. 503, pl. lxii., f. 13-16. Watson's Bay (W.), off P.J.
74 N. COMMUNIS, d'Orb.; C.R., p. 504, pl. lxii., f. 19-22. Watson's Bay (W.), off P.J.
75 N. HISPIDA, d'Orb.; C.R., p. 507, pl. lxiii., f. 12-16. Watson's Bay (W.), off P.J.
76 N. OBLIQUA, Linne; C.R., p. 513, pl. lxiv., f. 20-22. Watson's Bay (W), off P.J.
77 N. SCALARIS, Batsch; C.R., p. 510, pl. lxiii., f. 21-31; pl, lxiv., f. 16-19. Watson's Bay (W.), off P.J.
78 RHABDOGONIUM TRICARINATUM, d'Orb.; C.R., p. 525, pl. lxvii., f. 1-3. Watson's Bay (W.), off P.J.
79 VAGINULINA SPINIGERA, Brady; C.R., p. 531, pl. lxvii., f. 13-14. Off P.J.

80 CRYSTELLARIA CONVERGENS, Bornemann; C.R., p. 546, pl. lxix., f. 6, 7. Off P.J.
81 C. GIBBA, d'Orb., C.R., p. 546, pl. lxix., f. 8, 9. Off P.J.
82 C. ORBICULARIS, d'Orb., C.R., p. 549, pl. lxix., f. 17. Off P.J.
83 C. ROTULATA, Lamarck ; C.R., p. 547, pl. lxix., f. 13, *a.b.* Watson's Bay (W.), off P.J.
84 C. VARIABILIS, Reuss ; C.R., p. 541, pl. lxviii., f. 11-16. Watson's Bay (W.), off P.J.
85 C. ITALICA, Defrance, C.R., p. 544, pl. lxviii., f. 17, 18, 20-23. Watson's Bay (W.), off P.J.

Sub-Family POLYMORPHININÆ.

86 POLYMORPHINA ELEGANTISSIMA, Parker & Jones, C.R., p. 566, pl. lxxii, f. 12-15. Watson's Bay (W.), P.J.
87 P. SEGUENZANA, Brady ; C.R., p. 567, pl. lxxii., f. 16, 17. Watson's Bay (W.), P.J.
88 P. OBLONGA, d'Orb. ; C.R., p. 569, pl. lxxiii., f. 2-4. Watson's Bay (W.), off P.J.
89 P. REGINA, Brady ; C.R., p. 571, pl. lxxiii., f. 11-13. Common, Watson's Bay (W.), P.J.
90 UVIGERINA ASPERULA, Czjzek ; C.R., p. 578, pl. lxxv., f. 6-8. ; var. *ampullacea*, p. 579, pl. lxxv., f. 10-11. Watson's Bay (W), off P.J.
91 U. PYGMAEA, d'Orb. ; C.R., p. 575, pl. lxxiv., f. 11-12. Watson's Bay (W.), off P.J.
92 SAGRINA COLLUMELLARIS, Brady ; C.R., p. 581, pl. lxxv., f. 15-17. Watson's Bay (W.), off P.J.

Family GLOBIGERINIDÆ.

93 GLOBIGERINA BULLOIDES, d'Orb. ; C.R., p. 593, pls. lxxvii., lxxix., f. 3-7. Watson's Bay (W.), off P.J.
94 G. INFLATA, d'Orb. ; C.R., p. 601, pl. lxxix., f. 8-10. Watson's Bay (W.), off P.J.
95 G. RUBRA, d'Orb. ; C.R., p. 602, pl. lxxix., f. 11-16. Watson's Bay (W.), off P.J.
96 G. CONGLOBATA, Brady ; C.R., p. 603, pl. lxxx., f. 1-5 ; pl. lxxxii., f. 5. Watson's Bay (W.), off P.J.
97 G. HELICINA, d'Orb. ; C.R., p. 605, pl. lxxxi., f. 4-5. Watson's Bay (W.), off P.J.
98 G. SACCULIFERA, Brady ; C.R., 604, pl. lxxx., f. 11-17 ; pl. lxxxii., f. 4. Watson's Bay (W.), off P.J.
99 ORBULINA UNIVERSA, d'Orb. ; C.R., p. 608, pl. lxxvii. ; pl. lxxxi., f. 8-26 ; pl. lxxxii., f. 1-3. Watson's Bay (W.), off P.J.
100 PULLENIA SPHAEROIDES, d'Orb. ; C.R., p. 615, pl. lxxxiv., f. 12, 13. Watson's Bay (W.), off P.J.

101 P. QUINQUELOBA, Reuss; C.R., p. 617, pl. lxxxiv., f. 14, 15. Watson's Bay (W.), off P.J.
102 P. OBLIQUILOCULATA, Parker & Jones; C.R., p. 618, pl. lxxxiv., f. 16-20. Off P.J.
103 SPHAEROIDINA BULLOIDES, d'Orb.; C.R., p. 620, pl. lxxxiv., f. 1-7. Watson's Bay (W.), off P.J.
104 S. DEHISCENS, Parker & Jones, C.R., p. 621, pl. lxxxiv., f. 8-11. Off P.J.

Family ROTALIDÆ.

Sub-Family ROTALINÆ.

105 DISCORBINA TURBO, d'Orb.; C.R., p. 642, pl. lxxxvii., f. 8, *a. b. c.* Watson's Bay (W.), P.J.
106 D. VALVULATA, d'Orb.; p. 644, pl. lxxxvii., f. 5-7. Watson's Bay (W.), P.J.
107 D. PILEOLUS, d'Orb., p. 649, pl. lxxxix., f. 2-4. Watson's Bay (W.), P.J.
108 D. OPERCULARIS, d'Orb.; C.R., p. 650, pl. lxxxix., f. 8, 9. P.J.
109 D. VESICULARIS, Lamarck; C.R., p. 651, pl. lxxxvii., f. 2, *a. b. c.* Watson's Bay (W.), P.J.
110 D. BICONCAVA, Parker & Jones; C.R., p. 653, pl. xci., f. 2, 3. Watson's Bay (W.), P.J.
111 D. ALLOMORPHINOIDES, Reuss; C.R., p. 654, pl. xci., f. 5, 8. Watson's Bay (W.), P.J.
112 TRUNCATULINA LOBULATA, Walker & Jacob; C.R., p. 660, pl. xcii., f. 10; pl. xciii., f. 1, 4, 5; pl. xcv., f. 4, 5. Off P.J.
113 T. HAIDINGERII, d'Orb.; C.R., p. 663, pl. xcv., f. 7, *a.-c.* Watson's Bay (W.), off P.J.
114 T. TENUIMARGO, Brady; C.R., p. 662, pl. xciii., f. 2-3. Watson's Bay (W.), off P.J.
115 T. RETICULATA, Czjzek; C.R., p. 668, pl. xcvi., f. 5-8. Watson's Bay (W.), off P.J.
116 T. WUELLERSTORFI, Schwager, C.R., p. 662, pl. xciii., f. 8, 9. Watson's Bay (W.), off P.J.
117 ANOMALINA GROSSERUGOSA, Gumbel; C.R., p. 673, pl. xciv., f. 4-5. Watson's Bay (W.), off P.J.
118 PULVINULINA CANARIENSIS, d'Orb.; C.R., p. 692, pl. ciii., f. 8-10. Watson's Bay (W.), off P.J.
119 P. CRASSA, d'Orb.; C.R., p. 694, pl. ciii., f. 11-12. Off P.J.
120 P. MICHELIANA, d'Orb.; C.R., p. 694, pl. civ. f. 1, 2. Off P.J.
121 P. MENARDI, d'Orb.; C.R., p. 690, pl. ciii., f. 1-2. Watson's Bay (W.), off P.J.
122 P. PARTSCHIANA, d'Orb.; C.R., p. 669, pl. cv., f. 3, *a. b. c.* Woodcut, f. 21. Watson's Bay (W.), off P.J.
123 ROTALIA ORBICULARIS, d'Orb.; C.R., p. 706, pl. cvii., f. 5; pl. cxv., f. 6. Off P.J.

124 R. PAPILLOSA, Brady ; C.R., p. 708, pl. cvi., f. 9, *a.b.c.* ; var. *compressiuscula*, pl. cvii., f. 1, *a.b c.* Off P.J.

Sub-Family TINOPORINÆ.

125 POLYTREMA MINIACEUM, Linne ; C.R., p. 721, pl. c., f. 5-9 ; pl. ci., f. 1. Common in Port Jackson on shells &c. (W.)

Family NUMMULINIDÆ.

Sub-Family POLYSTOMELLINÆ.

126 NONIONINA UMBILICATULA, Montagu ; C.R., p. 726, pl. cix., f. 8-9. Off P.J.

127 POLYSTOMELLA IMPERATRIX, Brady ; p. 638, pl. cx., f. 13-15. Watson's Bay, (W.)

Order II. RADIOLARIA.

128 THALLASICOLLA AUSTRALIS, Haeckel ; Chall. Report, Vol. XVIII., pt. i., p. 20. Station 163.

129 SPHAEROZOUM OCTOCERUS, Haeck.; C.R., pt. i., p. 44. Station 163.

130 SIPHONOSPHAERIA FRAGILIS, Haeck.; C.R., pt. i., p. 106. Sydney.

131 DICTYOCEPHALUS AUSTRALIS, Haeck ; C.R., pt. ii., p. 1306, pl. lxii., f. 1. Station 164, surface.

132 CASTANARIUM HUXLEYI, Haeck. ; C.R., pt. ii., p. 1682. Station 165, surface.

133 CŒLOTHOLUS CRUCIATUS, Haeck. ; C.R., pt. ii., p. 1749. Station 164 A., 1200 faths.

INFUSORIA.

Class FLAGELLATA.

Order CILIO-FAGELLATA.

Family PERIDINIIDÆ.

134 CERATIUM TRIPOS? Mull. ; Saville Kent, Manual of the Infusoria, Vol. I., p. 454, pl. XXV., f. 24. Obtained in tow-net Watson's Bay (W).

135 C. FURCA,? Ehrenberg ; Saville Kent, l.c. Vol. I., p. 445, pl. XXV., f. 31. Obtained in tow-net Watson's Bay (W.)

Class CILIATA.

Order HETEROTRICHA.

Family TINTINNODÆ.

136 TINTINNUS sp. Representatives of this and allied genera appear to be fairly common on Algæ, Hydroids and Polyzoa in P.J. (W.)

Family STENTORIDÆ.

137 Folliculina hirundo, ? Saville Kent, l.c. Vol. II., p. 600, pl. xxix., f. 39. On *Bugula neritina*, Ball Head Bay. (W.)
138 F. sp. On seaweed, Botany. (W.)

Order PERITRICHA.

Family VORTICELLIDÆ.

This family is well represented in Port Jackson, I have seen examples of the following Genera :—Rhabdostyla, Vorticella, Carchesium, Zoothamnium, Cothurnia and Pyxicola. They are usually found attached to seaweeds, Hydroids, Polyzoa, and various free swimming crustacea.

Class TENTCULIFERA.

Order SUCTORIA.

Family ACINETIDÆ.

139 Podocyathus sp. On the stems of *Tubularia gracilis*, from Piles, Circular Quay, P.J. (W.)
140 Ophryodendron sp. On Sertularia off Balls Head. (W.)

Sub-Kingdom CŒLENTERATA.

Class PORIFERA.

Calcispongia.

Order HOMOCŒLA.

Family ASCONIDÆ.

1 Ascetta procumbens, R.v.L. ; P.L.S., N.S.W., Vol. IX., p. 1086, pl. lxi., figs. 1a, 1b, 1c, 1d ; pl. lxiii., fig. 2, 3, 4, 5, 6. Common on shells, stones, &c., also on a crab, *Cryptodromia lateralis*, Stimpson, Mossman's Bay ; Neutral Bay and many other places. (W.)
2 A. Macleayi, R.v.L. ; P.L.S., N.S.W , Vol. IX., p. 1086, pl. lix., f. 7 ; pl. lii., f. 8-13. Under stones, Farm Cove, P.J. (W.)
3 Ascaltis Lamarckii, Haeckel ; Die Kalkschwamme, Band II., Seite 60, pl. ix., f. 5 ; pl. x., f. 4, a-d. P.J.
4 Homoderma sycandra, R.v.L. ; P.L.S., N.S.W., Vol. IX., p. 1088, pl. lx., f. 14 ; pl. lxiv., f. 15 ; pl. lxiii., fis. 16-21 ; pl. lxv., figs. 22-33. P.J.
5 Leucopsis pedunculata, R.v.L. ; l.c., p. 1089. P.J.

Sub-Order Heterocœla.

Family SYCONIDÆ.

6 SYCANDRA ARBOREA, Haeckel ; l.c., Seite 331, pl. liii., figs. 1a, 1t; pl. lviii., f. 7. Very common under stones at low water mark, Watson's Bay ; Middle Harbour. (W.)

7 S. RAMSAYI, R.v.L. ; l.c., p. 1097, pl. v., figs. 35-36 ; pl. lxvi., f. 37 ; pl. lxii., figs. 38-40. In six fathoms off Shark Island. (Dr. Ramsay.)

Sub-Family UTEINÆ.

8 GRANTESSA SACCA, R.v.L. ; l.c., 1088, pl. lx., f. 41. Off Shark Island, and off Ball's Head, P.J. (Dr. Ramsay.)

9 AMPHORISCUS CYLINDRUS, Haeckel ; l.c., Seite 254, pl. xliii., f. 5-7, Band III. P.J.

10 A. POCULUM, Polejaeff ; Challenger Report, Vol. VII., p. 46, pl. iv., f. 4 ; pl. v., f. 2a, 2f. Station 163 A. off P.J.

11 GRANTIA LOBATA, R.v.L. ; l.c., p. 1106. P.J.

Family SYLLEIBIDÆ.

12 VOSMAERIA GRACILIS, R.v.L. ; l.c., p. 1111. P.J.

13 V. IMPERFECTA, Polejaeff ; C.R., Vol. VIII., p. 67, pl. vii., f. 9a, 9c. Off P.J.

14 V. HAECKELIANA, Polejaeff ; C.R., p. 69, pl. ii., f. 6 ; pl. viii., f. 1-0. Off P.J.

Family LEUCONIDÆ.

15 LEUCETTA MICRORHAPHIS, R.v.L. ; l.c., p. 1117. Off Shark Island, P.J.

16 LEUCALTIS HELENA, R.v.L. ; l.c., p. 1119. P.J.

17 L. BATHYBIA, Haeckel ; l.c., Seite 156, pl. xxviii., f. 2a, 2c., var. *Australiensis*, Ridley ; Zool. of "Alert," p. 482, pl. xliii., f. m. P.J.

18 LEUCORTIS LORICATA, Polejaeff ; C.R., Vol. VIII., p. 63, pl. ii., f. 2 ; pl. vii., f. 6a, 6b. Off P.J.

19 LEUCANDRA CONICA, R.v.L. ; l.c., p. 1126. Watson's Bay, under stones, P.J.

20 L. MEANDRINA, R.v.L. ; l.c., p. 1128, pl. lxvii., f. 43, 44. Off Ball's Head, 18 faths. P.J.

21 L. CATAPHRACTA, Haeckel, l.c., Band II., p. 203 ; Band III., pl. xxxii., f. 9a, 6f ; pl. xxxvii., f. 2. Cabbage-tree Bay (W.), P.J.

22 L. TYPICA, var. *tuba*, Polejaeff ; C.R., Vol. VIII., p. 56, pl. vii., f. 2a, 2c. Between Clark and Shark Islands, P.J.

23 L. VILLOSA, R.v.L. ; l.c., p. 1131. P.J.

24 L. VAGINATA, R.v.L ; l.c., p. 1133. Off Shark Island, P.J. (Dr. Ramsay.)

25 L. SACCHARATA, Haeckel ; l.c., Band II., p. 228 ; Band III., pl. xxxiii., f. 3a, 3e ; pl. 38, f. 7, 74. Off Ball's Head, and off Shark Island. (Dr. Ramsay.)

Family TEICHONIDÆ.

26 EILHARDIA SCHULZEI, Polejaeff ; C.R., p. 70, pl. ii., f. 7 ; pl. ix., 1-70. Off P.J.

Class SILICEA.

Order HEXACERATINA.

Family APLYSILLIDÆ.

27 IANTHELLA FLABELLIFORMIS, Gray ; P.Z.S., 1869, p. 50 ; R.v.L., Cat. Sponges, p. 23. Off Green Point. (Dr. Ramsay.)
28 APLYSILLA ROSEA, F. E. Schulze ; R.v.L., Cat. Sponges, p. 26. Off Ball's Head, 18 fms., P.J.
29 A. VIOLACEA, R.v.L. ; Cat. Sponges, p. 26. P.J.
30 DENDRILLA ELEGANS, R.v.L. ; l.c., p. 27. Off Cockatoo Island, P.J.
31 D. TENELLA, R.v.L. ; l.c., p. 27. Off Green Point, P.J.
32 D. CAESPITOSA, Carter ; Ann. & Mag., (5 Ser. 1886) Vol. xviii., p. 282, P.J.
33 D. ROSEA, R.v.L. ; var. *typica*, Cat. Sponges, p. 28. Off Green Point, P.J. (Dr. Ramsay.)
34 D. DIGITATA, R.v.L. ; l.c., p. 29. P.J.
35 D. JANTHELLIFORMIS, R.v.L. ; l.c., p. 29. P.J.
36 D. CAVERNOSA, R.v.L. ; l.c., p. 29. Off Green Point, P.J. (Dr. Ramsay.)

Family HALISARCIDÆ.

37 BAJALUS LAXUS, R.v.L.; Cat. Sponges, p. 30. On seaweed off Ball's Head, P.J.

Order CHONDROSSPONGIÆ.

Family GEODIDÆ.

38 ISOPS SOLLASI, R.v.L. ; l.c., p. 34. Shark Reef, P.J.

Family STELLETTIDÆ.

39 PSAMMASTRA GIGAS, R.v.L. ; l.c., p. 39. Off Green Point, P.J.

Family ANCHORINIDÆ.

40 ANCORINA AUSTRALIS, R.v.L. ; l.c., p. 41. On the roots of Laminarians, Neutral Bay. (Dr. Ramsay.)

Family TETILLIDÆ.

41 SPIRETTA RAPHIDIOPHORA, R.v.L. ; l.c., p. 43. P.J.

Family TETHYOPSILLIDÆ.

42 TETHYOPSILLA STEWARTII, R.v.L. ; l.c., p. 45. P.J. (Dr. Ramsay.)

Order MONAXONIA.

Family TETHYDÆ.

43 TETHYA MULTISTELLA, R.v.L. ; l.c., p. 47. Watson's Bay, P.J. (Dr. Ramsay.)
44 T. CORTICATA, R.v.L. ; l.c., p. 48. Neutral Bay, P.J. (Dr. Ramsay.)
45 T. FISSURATA, R.v.L.; l.c., p. 49. Under stones Neutral Bay, P.J.
46 T. INFLATA, R.v.L. ; l.c., p. 49. P.J. (Dr. Ramsay.)
47 T. LAEVIS, R.v.L. ; l.c., p. 50. P.J. (Dr. Ramsay.)
48 TETHYORRHAPHIS LAEVIS, R.v.L.; l.c., p. 52. P.J. (Dr. Ramsay.)
49 T. TUBERCULATA, R.v.L. ; l.c., p. 53. P.J. (Dr. Ramsay.)
50 T. GIGANTEA, R.v.L. ; Cat. Sponges, p. 54. P.J.
51 T. CONULOSA, R.v.L. ; l.c., p. 55. P.J. (Dr. Ramsay.)

Family SPIRASTRELLIDÆ.

52 SPIRASTRELLA AUSTRALIS, R.v.L. ; l.c., p. 57. Off Green Point, P.J.
53 S. PAPILLOSA, Ridley & Dendy ; Chall. Report, Vol. xx., p. 232, pl. xli., f. 5 ; pl. xlv., f. 11, 11g. P.J.
54 PAPILLINA PANIS, R.v.L. ; l.c., p. 58. Off Green Point, P.J. (Dr. Ramsay.)
55 P. RAMULOSA, R.v.L., l.c., p. 59. P.J.
56 RAPHYRUS HIXONII, R.v.L. ; l.c., p. 61. Off Green Point, P.J. (Dr. Ramsay.)
57 PAPILLISSA LUTEA, R.v.L. ; l.c., p. 64. Common under stones at low tide, Watson's Bay ; Neutral Bay (W.)

Family SUBERITIDÆ.

58 SUBERITES DOMUNCULA, Nardo ; R.v.L., l.c., p. 65. Watson's Bay, P.J.
59 S. CARNOSA, Johnstone, Brit. Sponges, p. 146, pl. xiii., f. 7-8 ; Zool. of "Alert," p. 165. P.J.
60 S. PERFECTUS, Ridley & Dendy ; C.R., Vol. xx., p. 200, pl. xli., f. 9 ; pl. xlv., f. 3a-b. P.J.
61 PLECTODENDRON ELEGANS, R.v.L. ; R.v.L., l.c., p. 66. P.J.
62 CLIONA sp., R.v.L.; l.c., p. 67. Common off Green Point. The colour when living is dark yellow.

Sub-Order Oligosilicina.

Family CHONDRILLIDÆ.

63 Chondrilla corticata, R.v.L. ; l.c., p. 70. P.J.
64 C. Australiensis, Carter ; Ann. & Mag., N.H 4 ser., Vol. xii., p. 23, (1873). P.J.
65 C. papillata, R.v.L. ; l.c., p. 71. P.J.

Family CHONDROSIDÆ.

66 Chondrosia Ramsayi, R.v.L. ; l.c., p. 72. P.J.
67 C. collectrix, R.v.L. ; l.c., p. 74. P.J.

Family HOMORRHAPHIDÆ.

68 Reniera collectrix, R.v.L., l.c., p. 78. P.J.
69 R. Australis, R.v.L. ; l.c., p. 79. Off Ball's Head ; Shark Reef, P.J.
70 R. megarrhaphea, R.v.L. ; p. 79. P.J.
71 R. pandæa, R.v.L. ; l.c., p. 79. Off Shark Island, P.J.
72 R. lobosa, R.v.L. ; l.c., p. 79. P.J.
73 Petrosia hebes, R.v.L.; l.c., p. 80. P.J.
74 Halichondria rubra, R.v.L. ; l.c., p. 80. Off Green Point ; Shark Reef, P.J.
75 H. rubra var. digitata, R.v.L. ; l.c., p. 81, pl. ii., f. 1. P.J.
76 H. mammillata, R.v.L. ; l.c., p. 81. P.J.
77 H. clathriformis, R.v.L.; l.c., p. 82. Maroubra Bay (W.), P.J.

Sub-Family Chalininæ.

78 Chalinopora subarmigera, Ridley, Zool. of "Alert" p. 397, P.J.
79 C. lamella, R.v.L. ; l.c., p. 85. P.J.
80 C. siphonopsis, R.v.L. ; l.c., p. 85. P.J.
81 Cladochalina euplax, R.v.L.; l.c., p. 85. P.J.
82 C. mollis, R.v.L. ; l.c., p. 86. Maroubra Bay.
83 Chalinissa communus, var. flabellum, R.v.L. ; l.c., p. 88. Off Green Point, P.J.
84 Pachychalina manus, R.v.L.; l.c., p. 88. Shark Reef, P.J.; Maroubra Bay.
85 P. lobata, Ridley ; Zool. of "Alert," p. 404 ; C.R., Vol. xx., p. 22, pl. v., f. 1, pl. xlvi,. f. 4. P.J.
86 P. megalorrhaphis, Ridley & Dendy ; C.R., Vol. xx., p. 23, pl. v., f. 6. P.J.
87 P. punctata, Ridley & Dendy ; C.R., p. 24, pl. 6, f. 2 *a*, *b*, *c*, pl. xlvi., f. 1, 2. Bondi Beach ; P.J.
88 Antherochalina dura, R.v.L. ; l.c., p. 90. P.J.
89 Placochalina pedunculata var. dura, Carter ; R.v.L., l.c., p. 91. Often washed ashore at Coogee ; Bondi, &c.

90 P. ——, var. POCULA, R.v.L. ; l.c., p. 91. P.J.
91 P. ——, var. MOLLIS, R.v.L. ; l.c., p. 91. P.J.
92 PHYLOSIPHONIA SUPERBA, R.v.L. ; l.c., p. 92. P.J.
93 P. INTERMEDIA, Ridley & Dendy ; C.R., p. 30, pl. vii., f. 1 ; pl. xlvi., f. 3. Off Ball's Head; Maroubra Bay.
94 P. SPICULIFERA, R.v.L. ; l.c., p. 92. P.J.
95 P. ANNULATA, Ridley & Dendy ; Ann & Mag. N.H., Ser. 3, Vol. XVIII., p. 331, (1887) R.v.L., l.c., p. 93. P.J.
96 SIPHONOCHALINA AXIALIS, R.v.L. ; l.c., p. 94. Off Green Point, P.J.
97 S. LAXA, R.v.L.; l.c., p. 95. P.J.
98 S. TYPICA, R.v.L. ; l.c., p. 96. Off Green Point, P.J.
99 S. OSCULATA var. MICROPORA, R.v.L. ; l.c., p. 97. Off Shark Reef, P.J.
100 SIPHONELLA TRUNCATA, R.v.L. ; l.c., p. 97. P.J.
101 S. COMMUNIS, R.v.L. ; l.c., p. 98. Off Ball's Head, P.J.
102 HAPLOCHALINA DENDRILLA, R.v.L. ; l.c., p. 98. Off Shark Reef ; Maroubra Bay.
103 DACTYLOCHALINA MONILATA, Ridley : Zool. "Alert," p. 394 ; R.v.L., l.c., p. 100. Off Green Point, P.J.
104 D. RETICULATA, R.v.L. ; l.c., p. 100. Maroubra Bay, (W.)
105 D. CYLINDRICA, R.v.L. ; l.c., p. 101. Maroubra Bay ; P.J.
106 ACERVOCHALINA FINITIMA, Schimdt ; Ridley, Zool. "Alert," p. 399. P.J.
107 TUBULODIGITES COMMUNIS, Carter ; Ann. & Mag. N. H., 5 Ser., Vol. IX., p. 367. P.J.
108 TOXOCHALINA ROBUSTA, Ridley ; Zool. "Alert," p. 403, pl. XXXIX., f. g, pl. xli., f. n, n. P.J.
109 EUCHALINA ELIGUA, var. SIMPLEX, R.v.L. ; l.c., p. 102. Washed ashore at Maroubra ; (W.), P.J.
110 CHALINODENDRON RAMOSUM, R.v.L.; l.c., p. 102, pl. iv., f. 2. P.J.
111 C. DENDRILLA, R.v.L. ; l.c., p. 103. P.J.

Family SPONGIDÆ.

112 CHALINOPSILLA DICHOTOMA, R.v.L. ; l.c., p. 107. Washed ashore at Maroubra ; (W.) P.J.
113 C. ARBOREA, var. MACROPORA, Duchassaing & Michelotti ; R.v.L., l.c., p. 110. P.J.
114 PHYLLOSPONGIA FOLIASCENS, Pallas ; R.v.L., l.c. p. 117. Off Shark Island ; Coogee Bay.
115 LEIOSELLA LAEVIS, R.v.L. ; l.c., p. 121. Washed ashore at Moroubra ; P.J
116 L. SILICATA, R.v L. ; l.c., p. 122. P.J.
117 EUSPONGIA OFFICINALIS, var. DURA, Hyatt ; R.v.L., l.c., p. 130. P.J.

118 E. IRREGULARIS, var. SILICATA, R.v.L. ; l.c., p. 134. P.J.
119 HIPPOSPONGIA CANALICULATA, var. DURA, R.v.L. ; l.c., p. 138. Maroubra Bay ; P.J.
120 H. ——, var. MOLLISSIMA, R.v.L., l.c., p. 140. P.J.
121 H. RETICULATA, R.v.L. ; l.c., p. 140. Off Ball's Head, P.J.
122 THORECTA EXEMPLUM, R.v.L. ; l.c., p. 142.
123 var. PRIMA, R.v.L. ; l.c., p. 143. Coogee Bay. P.J.
124 var. SECUNDA, Hyatt ; R.v.L., l.c., p. 144. P.J.
125 var. TERTIA, Hyatt ; R.v.L., l.c., p. 145. P.J.
126 var. MARGINALIS, R.v.L. ; l.c., p. 147. P.J.
127 T. SQUALIDUS, R.v.L. ; l.c., p. 148. P.J.
128 T. RAMSAYI, R.v.L. ; l.c., p. 149. P.J.
129 APLYSINOPSIS ELEGANS, R.v.L. ; l.c., p. 149. P.J.
130 A. DIGITATA, R.v.L. ; l.c., p. 150. Off Green Point, P.J.
131 APLYSINA SPICULIFERA, R.v.L. ; l.c., p. 152. P.J.
132 A. COCOS, R.v.L. ; l.c., p. 153. P.J.
133 DYSIDEOPSIS DIGITATA, R.v.L. ; l.c., p. p. 155. P.J.
134 D. SULPHUREA, R.v.L. ; l.c., p. 156. Off Shark Island, P.J.
135 HALME NIDUS-VESPARUM, R.v.L. ; l.c., p. 157. Maroubra Bay ; P.J.
136 H. VILLOSA, var. AULOPLEGMA, R.v.L. : p. 162. P.J.
137 H. FLABELLUM, R.v.L., l.c., p. 162. P.J.
138 STELOSPONGIA CANALIS, R.v.L. ; l.c., p. 164. P.J.
139 S. AUSTRALIS, R.v.L. ; l.c., p. 166. P.J.
140 var. CONULATA, Hyatt ; R.v.L., l.c., 168. Maroubra; Coogee ; P.J.
141 var. FOVEA, Polejaeff ; R.v.L., l.c., p. 170. Coogee ; Bondi ; P.J.
142 S. INTERTEXTUS, Hyatt, Mem. of Boston Soc., 11, p. 533. P.J.
143 HIRCINIA CAMPANA, R.v.L.; l.c., p. 178. Off Green Point, P.J.
144 H. AUSTRALIS, R.v.L., l.c., p. 180. Off Green Point, P.J.
145 H. CALYCULATA, R.v.L., p. 180. Off Shark Island, P.J.
146 H. ARENOSA, R.v.L. ; l.c., p. 181. P.J.
147 H. GIGANTEA, Ridley; R.v.L., l.c., p. 184. Off Green Point, P.J.
148 CACOSPONGIA MURRAYI, Polejaeff ; C.R., Vol. XI., p. 57, pl. iv., f. 3 ; pl. vi., f. 8. P.J.
149 C. VESICULIFERA, Polejaeff ; C.R., Vol. XI., p. 58, pl. iv., f. 2; pl. vi., f. 9. P.J.

Family HETERORRHAPHIDÆ.

150 STYLOTELLA DIGITATA, R.v.L. ; l.c., p. 185. Off Ball's Head, P.J. (Dr. Ramsay.)
151 S. RIGIDA, R.v.L. ; l.c., p. 186. P.J.
152 S. APLYSILLOIDES, R.v.L. ; l.c., p. 187. P.J.
153 RHIZOCHALINA RAMSAYI, R.v.L. ; l.c., p. 188. Off Shark Reef, P.J. (Dr. Ramsay.)

154 R. PETROSIA, R.v.L. ; l.c., p. 188. P.J.
155 R. PUTRIDOSUM, (Lamarck); Ridley & Dendy, C.R., Vol. xx., p. 33, pl. viii., f. 5, 5*a* ; pl. xix., f. 1—7. P.J.
156 GELLIODES POCULUM, Ridley & Dendy ; C.R., Vol. xx., p. 48, pl. x. ; R.v.L., l.c., p. 189. P.J.
157 GELLIUS PANIS, R.v.L. ; l.c., p. 189. P.J.
158 G. RAPHIDIOPHORA, R.v.L. ; l.c., p. 190. P.J.
159 G. FIBULATUS, (Schimdt); Ridley, Zool. of "Alert," p. 424. P.J.
160 TEDANIA RUBICUNDA, R.v.L. ; l.c., p. 190. P.J.
161 T. LAXA, R.v.L. ; l.c., p. 191. Off Ball's Head, P.J. (Dr. Ramsay.)
162 T. RUBRA, R.v.L. ; l.c., p. 191. Off Ball's Head, P.J. (Dr. Ramsay.)
163 T. TENUISPINA, R.v.L. ; l.c., p. 192. P.J.
164 T. DIGITATA, (Schimdt): Ridley & Dendy, C.R., p. 51, pl. xi., f. 3. P.J.
165 T. ——-, VAR. FIBROSA. P.J.

Family SPONGELIDÆ.

166 PHORIOSPONGIA LÆVIS, R.v.L. ; l.c., p. 193. Off Green Point, P.J.
167 P. RETICULUM, (Marshall) ; R.v.L., l.c., p. 193. Middle Harbour, P.J.
168 P. ——, VAR. PANIS, R.v.L. ; l.c., p. 195. P.J.
169 P. FIBROSA, Ridley ; Zool. of "Alert," p. 439, pl. xlii., f. g. P.J.
170 SIGMATELLA AUSTRALIS, R.v.L.; l.c., p. 195.
171 var. TUBARIA, (Marshall); R.v.L., l.c., 187. Shark Reef, P.J.
172 var. FLABELLUM, R.v.L. ; l.c., p. 198. Off Green Point, P.J.
173 S. MACROPSAMMA, R.v.L. ; l.c., p. 198. P.J.
174 S. CORTICATA, R.v.L.; l.c., p. 199. Off Shark Point, P.J.
175 var. PAPILLOSA, (Marshall); R v.L., l.c., p. 201. Maroubra Bay ; P.J.
176 var. FLABELLUM, R.v.L., l.c., p. 203. Off Green Point, P.J.
177 S. ——, VAR. SERRATA, R.v.L. ; l.c., p. 203. P.J.
178 PSAMMOPEMMA RUGOSUM, R.v.L. ; l.c., p. 205. P.J.
179 P. DENSUM, Marshall ; Zeits. f. Wissen. Zool. Bd. 35, p. 116, 1880 ; Polejaeff, C.R., Vol. xi. P.J.
180 SPONGELIA SPINIFERA, (F. E. Schulze) ; Polejaeff, C.R., Vol. xi., p. 41, 7 fath. off P.J.
181 S. ELASTICA, VAR. LOBOSA, (O. Schimdt) ; R.v.L., l.c., p. 208. Maroubra ; Coogee ; off Green Point, P.J.
182 S. CACOS, R.v.L. ; l.c., p. 209. P.J.
183 S. SAGUM, R.v.L. ; l.c., p. 209. Off Cockatoo Island, P.J.

Family DESMACIDONIDÆ.

184 SIDERODERMA NAVICELLIGERUM, Ridley & Dendy; R.v.L., l.c., p. 210, pl. ii., f. 2. Off Green Point; Shark Reef, P.J.
185 S. ZITTELLI, R.v.L.; l.c., p. 211. P.J.
186 ESPRELLA SERPENS, R.v.L.; l.c., p. 213. Off Shark Point, P.J.
187 E. PENICILLIUM, R.v.L.; l.c., p. 213. P.J.
188 E. MURRAYI, Ridley & Dendy; C.R., Vol. xx., p. 67, pl. xiii., f. 11, 13, 14, 16, 17, 18; pl. xiv., f. 1, 1a. Off P.J.
189 E. POROSA, Ridley & Dendy, l.c., p. 69, pl. xv., f. 6, 9, 17; pl. xvi., f. 5. Off P.J.
190 ESPERIOPSIS CYLINDRICA, Ridley & Dendy; l.c., p. 79, pl. xix., f. 2 *a*, *b*, *c*. 30 – 35 fath. off P.J.
191 AMPHILECTUS CERATOSUS, Ridley & Dendy; l.c., p. 125, pl. xix., f. 10, 10*a*; pl. xxv., f. 6; pl. xlvii., f. 2. Off P.J.
192 MYXILLA JACKSONIANA, R.v.L.; l.c., p. 214. Off Green Point; Middle Harbour; P.J.
193 M. ARBORESCENS, Ridley; Zool. of "Alert," p. 433, pl. xl., f. g; pl. xliii., f. a,a. P.J.
194 CRELLA SCHIMDTII, Ridley; Zool. of "Alert," p. 432, pl. xli., f. a, a. P.J.
195 CLATHRIODENDRON ARUSCULA, R.v.L.; l.c., p. 215. Off Ball's Head, P.J.
196 C. IRREGULARIS, R.v.L.; l.c., p. 215. P.J.
197 CLATHRISSA ARBUSCULA, R.v.L.; l.c., p. 217, pl. v., f. 2. Ball's Head Bay, P.J.
198 C. ELEGANS, R.v.L.; l.c., p. 218. Maroubra Bay, (W.) P.J.
199 C. PUMILA, R.v.L.; l.c., p. 218. P.J.
200 var. RUBRA, R.v.L.; l.c., p. 212. P.J.
201 CLATHRIA LENDENFELDI, Ridley & Dendy; C.R., Vol. xx., p. 148, pl. xxviii., f. 5; pl. xxix., f. 6; pl. xlvii., f. 5. Off P.J.
202 C. PYRAMIDA, R.v.L.; l.c., p. 222. Off Green Point, P.J.
203 ECHINOCLATHRIA CARTERI, Ridley & Dendy; l.c., p. 162, pl. 29, f. 12, 12a; pl. xxxi., f. 3, 3a. Off P.J.
204 ECHINONEMA ANCHORATUM, Carter; Ann. & Mag. N.H., 5 Ser., Vol. VII., p. 378, (1881); R.v.L., l.c., p. 219.
205 var. RAMOSA, R.v.L.; l.c., p. 219. P.J.
206 E. LAEVIS, R.v.L.; l.c., p. 220. Off Green Point, P.J.
207 E. RUBRA, R.v.L.; l.c., p. 221. P.J.
208 THALLASODENDRON RUBENS, R.v.L.; l.c., p. 223. Off Shark Reef, P.J.
209 var. DURA, R.v.L.; l.c., p. 224. Maroubra Bay, (W.) P.J.
210 var. LAMELLA, R.v.L.; l.c., p. 224, pl. vii. Off Ball's Head, P.J.
211 T. PAUCISPINA, R.v.L.; l.c., p. 224. P.J.
212 PLECTISPA ELEGANS, R.v.L.; l.c., p. 226. Maroubra Bay, (W.); P.J.

213 P. ARBOREA, R.v.L.; l.c., p. 226. Maroubra Bay,(W.); P.J.
214 CLATHRIOPSAMMA LOBOSA, R.v.L.; l.c., p. 227. Off Ball's Head, P.J.

Family AULENIDÆ.

215 AULENA LAXA, R.v.L.; l.c., p. 228. Off Green Point; off Ball's Head, P.J.
216 var. MINIMA, R.v.L.; l.c., p. 228. P.J.
217 var. DIGITATA, R.v.L.; l.c., p. 229. P.J.
218 A. GIGANTEA, R.v.L.; l.c., p. 230. Off Green Point, P.J.
219 var. MACROPORA, R.v.L.; l.c., p. 231. Off Green Point, P.J.

Family AXINELLIDÆ.

220 AXINELLA HISPIDA, (Montagu); R.v.L.
221 var. GRACILIS, R.v.L.; l.c., p. 235. Maroubra Bay,(W.); P.J.
222 var. TENELLA, R.v.L.; l.c., p. 235. P.J.
223 A. AURANTIACA, R.v.L.; l.c., p. 235, pl. v,, f. 1. Maroubra Bay, (W.); P.J.
224 A. INFLATA, R.v.L.; l.c., p. 236. P.J.
225 A. OBTUSA, R.v.L.; l.c., p. 236. P.J.
226 A. ARBORESCENS, Ridley & Dendy; C.R., Vol. XX., p. 178, pl. XXXV., f. 4, 4a. P.J.
227 PHAKELLA FLABELLATA, Ridley & Dendy; l.c., p. 171, pl. XXXIV., f. 2, 3, 3*a*. Off P.J.
228 HYMENIACIDON CARUNCULA, Bowerbank; Brit. Sponges, p. 146, pl. xiii., f. 7 – 8; Ridley, Zool. of "Alert," 465. P.J.
229 H. AGMINATA, Ridley; Zool. of "Alert," p. 146, pl. xli., f. e; pl. xliii., f. f, f. P.J.

CNIDARIA.

ACTINOZOA.

ALCYONARIA=OCTACTINIA.

Order ALCYONACEA.

Family CORNULARIIDÆ.

230 CORNULARIA? AUSTRALIS, Busk.; Q. J. Micro. Sci., 1867, p. 243, pl. XXXVI., f. 7 – 9. This species probably belongs to the Genus *Sarcodictyon*. Maroubra Bay, on *Catenicella plagiostoma*, (W.)
231 CLAVULARIA ROSEA,? Studer Monatsberichte, Akad. Wissen. Berlin, 1878, p. 633, pl. i., f. 1 *a-b*. Creeping over shells and stones, Taylor Bay; Watson's Bay, (W.)

232 C. sp. A cream coloured species rather less than the preceding. Under stones at Watson's Bay ; Rose Bay ; and in 16 fms. off Ball's Head, P.J. (W.)

233 Telesto Smithii, Gray ; Ann. & Mag. N.H. (4) Vol. iii., p. 21, figure (woodcut) 1869. Common under rock ledges at low water, Vaucluse Point ; Middle Harbour ; and in 16 fms. off Ball's Head, P.J. (W.)

234 Sympodium sp. This species forms thin incrusting patches 6 to 10 inches in diameter on stones, the colour being bluish-grey, whilst the polyps are brown and longitudinally sulcate. Rose Bay ; Watson's Bay, P.J. (W.)

Family ALCYONIDÆ.

235 Alcyonium sp. Off Ball's Head, P.J.

Family NEPHTHYIDÆ.

236 Eunephthya fusca, Wright & Studer ; C.R., Vol. xxxi., p. 190, pl. xxxvi., f. 1, *a-b*. Under rock ledges Middle Harbour (W); Station 163 A. off P.J.

237 Spongodes florida, Esper. ; Gray, P.Z.S., 1862, p. 27, pl. iv., f. 1 – 4. Off Green Point P.J.

Order PENNATULACEA.

Family PTERŒIDIDÆ.

238 Ptereoides Lucazii, Kolliker, var. spinosa, Anat. Syst. Beschreib. der Alcyonarien, 1872, p. 60 – 62, f. 15 – 17, and p. 355. Off Green Point, P.J.

239 P. sp. Off Ball's Head, P.J.

240 Sarcophyllum grande, Gray ; Proc. Z. Soc., 1848, p. 45 ; Koll., l.c., p. 121 and 364, pl. viii., f. 66 A, B,a. Common off Green Point, P.J.

Family PENNATULIDÆ.

241 Pennatula Moseleyi, Kolliker ; C.R., Vol. i., p. 7, pl. ii., f. 8-9, Station 164, off P.J.

Family VIRGULARIDÆ.

242 Virgularia elegans, Gray ; Catalogne of Sea Pens. in British Museum, p. 15 ; Kolliker, Anat. Syst. Alcyonarien 1872, p. 60-62, f. 15-17, also p. 355. Off Green Point, P.J.

243 V. Lovenii, Koll. ; l.c., p. 201, pl. xiii., f. 121, 122. Off Ball's Head, P.J.

244 V. sp. Off Ball's Head, P.J.

245 V. sp. Off Shark Island, P.J.

Family CAVERNULARIDÆ.

246 CAVERNULARIA OBESA, Val.; Koll., l.c., p. 338, pl. xxii., f. 199, 200, 201. Off Green Point, P.J.

Family LITUARIDÆ.

247 POLICELLA AUSTRALIS, Gray ; Cat. of Sea Pens., p. 33 ; Koll., l.c., p. 321, P.J.

248 CLAVELLA AUSTRALASIÆ, Gray ; Cat. of Sea Pens., p. 33 ; Koll., 322, pl. 22, f. 194. Off Ball's Head ; off Green Point, P.J.

Order GORGONACEA.

Section SCLERAXONIA.

Family BRIAREIDÆ.

249 SUBERIA GENTHI, Wright & Studer ; C.R., Vol. XXXI., p. 163, pl. xl., f. 1. In shallow water, off P.J.

Family MELITODIDÆ.

250 MOPSELLA COCCINEA, Ellis & Solander ; Natural History of Zoophytes, 1786, p. 107, pl. xii., f. 5. Under rocks and stones, Watson's Bay, (W.)

251 PARISIS AUSTRALIS, Wright & Studer ; C.R., Vol. XXXI., p. 183, yl. xli., f. 3. Station 163 B, off P.J. There is a series of specimens of this species in the Australian Museum. also obtained off P.J.

Section II. HOLAXONIA.

Family ISIDÆ.

Sub-Family MOPSEINÆ.

252 MOPSEA DICHOTOMA, Linne ; W. & S., C.R., Vol. XXXI., p. 41, pl. ix., f. 10. Off P.J. 30 – 35 fms.

253 ACANTHOISIS FLABELLUM, Wright & Studer ; C.R., Vol. XXXI., p. 45, pl. viii., f. 1. This species is bright red when alive. Maroubra Bay (W.); off P.J. 30 – 35 fms.

Family PRIMNOIDÆ.

254 PLUMARELLA PENNA, Lamarck ; = *Cricogorgia ramea*, M.-Ed. Hist. Nat. Corall., pl. B 2, f. 6. Off P.J.

255 PRIMNŒLLA GRANDISQUAMIS, Wright & Studer ; C.R., Vol. XXXI., p. 86, pl. xvii., f. 4 ; pl. xxi., f. 1-3. Station 163 A off P.J.

256 P. AUSTRALASIÆ, Gray ; P.Z.S., 1849, p. 146, pl. ii., f. 8-9 ; C.R., Vol. XXXI., p. 88, pl. xviii., f. 1 ; pl. xxi., f. 15. Off P.J.

Family PLEXAURIDÆ.

257 PLEXAURA SP. Off Ball's Head, P.J.

Family ? ?

258 SYDELLA AUSTRALIS, Gray ; P.Z.S., 1872, p. 747, pl. lxiii., f. 7-8. Described from a drawing (by Dr. Hooker) Sydney.

ZOANTHARIA=HEXACTINIA.

Family ACTINIDÆ.

259 PARACTIS PAPAVER, Drayton in Dana, U. S. Expl. Exp., Zoophytes p. 143, pl. iv., f. 29. Common under stones, Coogee, Bondi (W.)

260 PHYMACTIS VERATRA, Drayton in Dana, l.c., p. 129, pl. i., f. 3. Common in Port Jackson and at Coogee Bay (W.)

261 OULACTIS MUSCOSUM, Drayton, Dana, l.c., p. 153, pl. v., f. 42. Common in rock-pools, Coogee, Bondi (W.)

262 CEREUS TUBERCULOSUS, Quoy and Gaimard ; Voy. "Astrolabe" p. 159, pl. xi., f. 3-6. On the beach, Coogee Bay (W.) ; off Green Point, (Dr. Ramsay).

263 PHELLIA SP. Under stones Neutral Bay (W.)

264 BUNODES SP. Rose Bay (W.)

265 CERIANTHUS SP. Lives as a commensal with *Phoronis Australis* off Ball's Head (Dr. Ramsay).

266 ADAMSIA SP. Parasitic on Cellepora off Green Point (W).

267 ZOANTHUS SP. Littoral, Bradley's Head, P.J. (W.)

268 POLYTHOA SP. A small incrusting species covered with sand grains, growing on a sponge *(Papillissa lutea)*, (W.)

MADREPORARIA APOROSA.

Family TURBINOLIDÆ.

269 SPHENOTROCHUS EXCAVATUS, Tenison-Woods; P.L.S., N.S.W. Vol. II., p. 308, pl. iv., f. 1 *a*, *b*, *c*. Very rare, P.J. (John Brazier.)

270 CONOCYATHUS ZEALANDIÆ, Duncan ; P.Z.S., London, 1876, p. 431, pl. xxxviii., f. 1-3. Frequent in dredgings of Green Point, P.J.

271 C. COMPRESSUS, Ten.-Woods ; P.L.S., N.S.W., Vol. II., p. 302, pl. v., f. 1 and 6. Dredged at Quarantine Station, P.J. (Dr. E. P. Ramsay.)

272 DUNOCYATHUS PARASITICUS, Ten.-Woods, l.c., p. 305, pl. v., f. 4 *a*, *b*. Dredged off P.J. (John Brazier). This species is imbeded in the base of a species of Polyzoa *Bipora angulopora*, Ten.-Woods. (In Macleay Museum.)

Family POCILLOPORIDÆ.

273 POCILLOPORA? SP. Long Bay (Ed. McIntosh.)

Family ASTRÆIDÆ.

274 CYLICIA QUINARIA, Ten.-Woods, l.c., p. 326, pl. v., f. 3 *a, b, c.* Very common under stones, all round Port Jackson, Mossman's Bay, Neutral Bay, Watson's Bay (W.)

275 C. TENELLA, Dana; U.S. Expl. Exp., Zoophytes, 377, pl. xxviii., f. 6, 6*a-b.* Rare, under stones, Watson's Bay P.J. (W.)

276 PLESIASTRAEA URVILLEI, Edwards & Haime, Ann. des Sci. Nat., 3 Ser., Vol. x., pl. ix., f. 2, 2*a*, and Vol. XII., p. 117; Quoy & Gaimard, Voy. "Astrolabe," Zoophytes, p. 216, pl. xvii., f. 10 – 14. (*Astraea galaxea).* Frequent at Taylor Bay; Watson's Bay P.J. (W.)

Family LOPHOSERIDÆ.

277 LOPHOSERIS CRISTATA, Ellis & Solander, Nat. Hist., Zoophytes p. 158, pl. xxxi., f. 3-4; Tenison-Woods, l.c., p. 331. Manly Beach.

MADREPORARIA PERFORATA.

Family EUPSAMMIDÆ.

278 BALANOPHYLLIA BUCCINEA, Ten.-Woods; l.c., p. 339, pl. v., f. 5 *a, b, c*; and pl. iv., f. 5. Under stones Cabbage Tree Bay, P.J. (W.)

279 EUDOPACHYS AUSTRALIÆ, Ten.-Woods, l.c., p. 333, pl. vi., f. 1 *a, b, c.* Off P.J., 80 fathoms.

280 HETEROPSAMMIA ELLIPTICA, Ten.-Woods, l.c., p. 339, pl. vi., f. 3 *a, b.* Off P.J., 16 fathoms.

281 DENDROPHYLLIA AUREA, Quoy & Gaim., Voy. "Astrolabe," Vol. IV., p. 195, pl. xv., f. 7 – 11; Ed. & H., Hist. Nat. Corall., Vol. III., p. 130, P.J.

HYDROZOA.

Order HYDROMEDUSÆ.

Sub-Order HYDROPOLPINÆ.

Family CLAVIDÆ.

282 CLAVA SIMPLEX, R.v.L.; Proceedings Linnean Society N.S. Wales, Vol. IX., p. 349. Littoral, P.J.

Family CERATELLIDÆ.

283 CERATELLA FUSCA, Gray; Bale, C.H.Z., p. 48; P.L.S., N.S. Wales, Vol. III., Ser. 2, p. 748. Coogee Bay (W.)

Family EUDENDRIDÆ.

284 EUDENDRIUM PUSILLUM, R.v.L.; l.c., p. 352. Littoral, P.J.

Family BLASTOPOLYPIDÆ.

285 LAOMEDEA MARGINATA, Bale, Cat. Hydroid Zoophytes, p. 54, pl. i., f. 2. Littoral, on stones Vaucluse Point, and on seaweeds Coogee Bay (W.)

286 L. UNDULATA, Lamx.; Bale, C.H.Z., p. 55, pl. ii., f. 4. P.J.

287 LAFŒA SCANDENS, Bale, P.L.S., N.S.W., Vol. III., Ser. 2, p. 758, pl. xiii., f. 16-19. On *Sertularella divaricata*, var. *sub-dichotoma*, off Ball's Head, P.J. (W.)

288 HALECIUM TELESCOPICUM, Allman, C.R., Vol. XXIII., p. 10, pl. v., f. 1, 163 B. P.J.

289 H. GRACILE, Bale; l.c., p. 759, pl. xiv., f. 1-3. P.J.

290 H. PARVULUM, Bale; l.c., p. 760, pl. xiv., f. 4-5. On sponge Bondi, (W.)

291 LINEOLARIA SPINULOSA, Hincks; Ann. & Mag. N.H. (3) Vol. VII., 1861; Bale, C.H.Z., p. 61, pl. i., f. 10-11; pl. xix., f. 38. On Zosteria Botany Bay; Middle Harbour (W.)

292 SYNTHECIUM ORTHOGONIUM, Busk; Voy. of "Rattlesnake," Bale, C.H.Z., p. 88, pl. ix., f. 11; P.L.S., N,S.W., p. 767, pl. xvii., f. 1-5. Common off Ball's Head and at Green Point (W.)

293 S. CAMPYLOCARPUM, Allman; C.R., Vol. XXIII., p. 78, pl. xxxvii., f. 1 *a*, *b*. *c*. Off P.J.

294 S. ALTERNANS, All.; C.R., Vol. XXIII., p. 80, pl. xxxvii., f. 2, 2a. Off P.J.

295 SERTULARELLA DIVARICATA, Busk; Voy. of "Rattlesnake,' Bale, C.H.Z., p. 110, pl. iii., f. 9; pl. xix., f. 20.

296 var. SUB-DICHOTOMA, Bale; P.L.S., N.S.W., p. 761, pl. xvi., f. 3-4. Off Ball's Head.

297 var. DUBIA, Bale; l.c., p. 761, pl. xvi., f. 1-2. Bondi Bay (W.)

298 S. SOLIDULA, Bale, C.H.Z., p. 106, pl. iii., f. 6; pl. xix., f. 28. P.L.S., N.S.W., p. 765, pl. xv., f. 3-4. On seaweeds Bondi Bay (W.)

299 S. LONGITHECA, Bale, P.L.S., N.S.W., p. 762, pl. xvi., f. 5-6. P.J., (W.)

300 S. VARIABILIS, Bale, P.L.S., N.S.W., p. 765, pl. xv., 5-9. Bondi Bay; Coogee Bay (W.)

301 S. CYLINDRICA, Bale, l.c., p. 765, pl. xvi., f. 7. Off Ball's Head, P.J.

302 DIPHASIA PINNATA, Pallas; Bale, C.H.Z., p. 98, pl. ix., f. 1. Off Ball's Head, P.J.

303 D. SUBCARINATA, Busk; Bale, C.H.Z., p. 102, pl. iv., f. 1; pl. xix., f. 18. Washed ashore at Maroubra Bay, (W.)

304 PASYTHEA QUADRIDENTATA, Ellis & Solander; Bale, C.H.Z., p. 112, pl. vii., f. 3; P.L.S., N.S.W., p. 770, pl. xiv., f. 6-7. On seaweeds, common, Coogee; Bondi, (W.)

305 THUIARA LATA, Bale, C.H.Z., p. 120, pl. vii., f. 4. Maroubra Bay; off Ball's Head, P.J. (W.)

306 T. SINUOSA, Bale, P.L.S., N.S.W., 1888, p. 772. Washed ashore at Maroubra Bay, (W.)

307 T. SUBARTICULATA, Coughtrey; Bale, P.L.S., N.S.W., 1888, p. 746, pl. vii., f. 4-5. Washed ashore at Maroubra, (A. J. Coates).

Family PLUMULARIDÆ.

308 AZYGOPLON PRODUCTA, Bale, C.H.Z., p. 133, pl. x., f. 4; P. L.S., N.S.W., p. 774, pl. xix., f. 1-5. Coogee Bay; Botany Bay (W.)

309 PLUMULARIA RUBRA, R.v.L., P.L.S., N.S.W., Vol. IX., p. 476, pl. xiii., f. 11-12; pl. xiv., f. 15; Bale, P.L.S., N.S.W., p. 778, pl. xx., f. 1-6. Off Ball's Head and off Green Point, P.J.

310 P. CALICULATA, Bale, P.L.S., N.S.W., p. 781, pl. xx., f. 9-10. Bondi Bay; Port Jackson (W.)

311 P. SP. Washed ashore at Maroubra Bay.

312 P. SETACEOIDES, Bale, C.H.Z., p. 136, pl. xi., f. 8; pl. xix., f. 36; P.L.S., N.S.W., p. 781, pl. xx., f. 7-8. Middle Harbour; Bondi Bay, (W.)

313 P. SPINULOSA, Bale, C.H.Z., p. 139, pl. xii., f. 11, 12; P.L.S., N.S.W., p. 783, pl. xix., 11-13. On seaweeds Coogee Bay(W)

314 P. PULCHELLA, Bale, C.H.Z., p. 140, pl. xii., f. 6; pl. xix., f. 37; P.L.S., N.S.W., p. 784. On seaweeds Bondi Bay(W.)

315 P. COMPRESSA, Bale, C.H.Z., p. 142, pl. xii., f. 9-10; pl. xix., f. 30, 40; P.L.S., N.S.W., p. 784, pl. xix., f. 14. On Zosteria, Botany Bay (W.)

316 P. AURITA, Bale, P.L.S., N.S.W., Vol. III., Ser. 2, p. 784, pl. xix., f. 15-19. On Zosteria, Botany Bay, (W.)

317 P. ARMATA, Allman, C.R., Vol. VII., p. 19, pl. i., f. 5-6. Station 163 off P.J.

318 P. LAXA, Allman, C.R., Vol. VII., p. 22, pl. iv., f. 3-4. Station 163 A, off P.J.; 30 B, 5 fms.

319 HALICORNARIA PROLIFERA, Bale, C.H.Z., p. 183, pl. xiv., f. 1; pl. xvi., f. 10. On the root-like base of seaweed, Coogee Bay (W.)

320 H. LONGIROSTRIS, Kirchenpauer; Bale, C.H.Z.. p. 181, pl. xiii., f. 7; pl. xvi., f. 3; pl. xix., f. 30. Often found with the preceding species, Coogee Bay, (W.)
321 H. ASCIDIOIDES, Bale, C.H.Z., p. 176, pl. xiii., f. 2; pl. xvi., f. 1. Maroubra Bay; Coogee Bay, (W.)
322 H. FURCATA, Bale, C.H.Z., p. 178, pl. xiii., f. 3; pl. xvi., f. 5. Washed ashore at Maroubra (W.)
323 AGLAOPHENIA PARVULA, Bale, C.H.Z., p. 165, pl. xiv., f. 3; pl. xvii., f. 10; P.L.S., N.S.W., p. 790. Coogee Bay; Vaucluse Point (W.)
324 A. MACROCARPA, Bale, P.L.S., N.S.W., p. 791, pl. xxi., f. 3-4. Off P.J.
325 A. DIVARICATA, Busk; Bale, C.H.Z., p. 162, pl. xv., f. 7-8; pl. xvii., f. 6-7. Bondi, Coogee, Watson's Bay, (W.)
326 A. PLUMOSA, Bale, C.H.Z., p. 153, pl. xiv., f. 5; pl. xvii., f. 12. On Boltenia, Middle Harbour; Bondi; Coogee; Botany, (W.)
327 A. WHITELEGGEI, Bale, P.L.S., N.S.W., p. 794, pl. xxi., f. 8. Off Green Point, P.J., (W.)
328 A. SINUOSA, Bale, P.L.S., N.S.W., 1888, p. 790, pl. xxi., f. 1-2. Washed ashore at Maroubra Bay (W.)

Sub-Order HYDROMEDUSIDÆ.

Family ANTHOMEDUSIDÆ.

329 SARSIA RADIATA, R.v.L., P.L.S., N.S.W., Vol. IX., p. 583, pl. XX., f. 31. P.J.
330 S. MINIMA, R.v.L., l.c., p. 584, pl. xxi., f. 34. P.J.
331 S. SP. On seaweed in rock pools Rose Bay (W.)
332 EUPHYSA AUSTRALIS, R.v.L., l.c., p. 586, pl. xxi., f. 23. P.J.
333 PANDAEA MINIMA, R.v.L., l.c., p. 909-916, pl. xlii., f. 10-12. August-September, P.J.
334 TURRITOPSIS LATA, R.v.L., l.c., p. 588, pl. xxii., f. 36. Summer and Autumn. P.J.
335 LIZUSA PROLIFERA, R.v.L., l.c., p. 589, pl. xxiii., f. 38-39. April-March. P.J.
336 MARGELIS TRINEMA, R.v.L., l.c., p. 918, pl. xli., f. 13. Early spring. P.J.

Family TUBULARIDÆ.

337 PENNARIA AUSTRALIS, Bale, C.H.Z., p. 45; P.L.S., N.S.W., Vol. III., Ser. 2, p. 747, = *Pennaria rosea*, R.v.L., P.L.S., N.S.W., Vol. IX., p. 594, pl. xxiv., f. 40-42. On piles, Circular Quay; Green Point, (W.)
338 P. ADAMSIA, R.vL., P.L.S., N.S.W., p. 595, pl. xxv., f. 45, 48; pl. xxvi., f. 49. P.J.

339 TUBULARIA SPONGICULA, R.v.L., l.c., p. 597, pl. xxvi., f. 50. Middle Harbour, P.J., (W.)
340 T. GRACILIS, R.v.L., l.c., p. 597, pl. xxvii., f. 51, 52. Off Ball's Head ; on piles Circular Quay, P.J., (W.)

Family LEPTOMEDUSÆ.

341 OCTORHOPALON FERTILIS, R.v.L., l.c., p. 919, pl. xlii., f. 14-15. Early spring, P.J.
342 EUCOPE HYALINA, R.v.L., l.c., p. 920, pl. xlii., f. 16, 17, 18. Early spring P.J.
343 OBELIA GENICULATA, Linne ; Bale, C.H.Z., p. 59 pl. ii., f. 2. On seaweed, Middle Harbour, (W.)
344 O. ANGULOSA, Bale, P.L.S., N.S.W., p. 752, pl. xii., f. 3. On piles Callan Park, Parramatta River, (W.)
345 O. AUSTRALIS, R.v.L., P.L.S., N.S.W., Vol. IX., p. 604 ; Bale, P.L.S., N.S.W., p. 753, pl. xii., f. 1-2. P.J.
346 TIAROPSIS MACLEAYI, R.v.L., P.L.S., N.S.W., Vol. IX., p. 605, pl. xxiii., f. 37. April-July. P.J.
347 MITROCOMIUM ANNAE, R.v.L., l.c., p. 606, pl. xxix., f. 58-60. April-June. P.J.
348 EUCOPELLA CAMPANULARIA, R.v.L. ; Zeits. für Wissenschaftliche Zoologie, Band XXXVIII., p. 497 ; Bale, P.L.S., N.S.W., p. 751, pl. xiii., f. 9-15. Very common on seaweeds, Middle Harbour ; Coogee ; Bondi, (W.)

Family CAMPANULINIDÆ.

349 CAMPANULARIA CALICULATA, Hincks, Ann. & Mag. N.H., (3) Vol. XI. ; Bale, P.L.S., N.S.W., p. 755, pl. xiii., f. 1-3. Middle Harbour, (W.)
350 C. SPINULOSA, Bale, l.c., p. 756, pl. xii., f. 5-7. Off Ball's Head, P.J.
351 C. SERRULATA, Bale, l.c., p. 457, pl. xii., f. 4. Off Ball's Head, P.J.
352 C. TINCTA, Hincks, Ann. & Mag., N.H., 1861 ; Bale, C.H.Z., p. 57, pl. i., f. 4-6. Middle Harbour, (W.)
353 SERTULARIA COMPLEXA, Clarke ; Bale, l.c., p. 769, pl. xviii., f. 1-4. Bondi Bay, (W.)
354 S. ELONGATA, Lamx. ; Bale, C.H.Z., p. 75, pl. vi., f. 7-8 ; pl. xix., f. 7 ; P.L.S., N.S.W., p. 770. Bondi ; Coogee, (W.)
355 S. UNGUICULATA, Busk ; Bale, C.H.Z , p. 76, pl. vi,, f. 9-12. On seaweeds, Coogee ; Bondi (W.)
356 S. MINIMA, D'A. Thompson ; Bale, C.H.Z., p. 89, pl. iv., f. 9-10 ; pl. xix., f. 12-13. Coogee ; Bondi (W.)
357 S. BIDENS, Bale, C.H.Z., p. 70, pl. vi., f. 6 ; pl. xix., f. 1. On the roots of Laminarians, Maroubra. (Mr. A.J.Coates.)

358 S. MAPLESTONEI, Bale, Cat. Hydroida, p. 70, pl. vi., f. 4; pl. xix., f. 2. Hunter's Beach, Middle Harbour. (A. J. Coates.)
359 S. MACROCARPA, Bale, Cat. H.Z., p. 80, pl. v., f. 2; pl. xix., f. 11. Hunter's Beach; Maroubra. (A. J. Coates.)
360 S. OPERCULATA, Linne; Bale, Cat. H.Z., p. 67, pl. vi., f. 1; pl. xix., f. 3. Hunter's Beach. (A. J. Coates.)

SIPHONOPHORA.

361 DIPHYES SP. See P.L.S., N.S.W., Vol. x., p. 187. Abundant on the beach, (April 1885) Coogee Bay, (W.)
362 PHYSOPHORA CUPULITA, (Boodwich); Q. & G., Voy. de l'Uranie, pl. lxxxvii., f. 14-16; Lesson, Zoop. Acephales, p. 508. P.J.
363 PHYSALIA MEGALISTA, Brandt, Prod. 36; Lesson, Zoop. Acephales, p. 558; Peron & Lesueur, Voy. Dec. aux. terres australis, pl. xxxix., f. 1. Common after gales, Bondi; Coogee; P.J. (W.)
364 P. UTRICULUS, Eschscholtz, System der Acalephen, 1829, p. 163, pl. xiv., f. 2-3. Common after gales, Coogee and Bondi; P.J. (W.)
365 VELELLA CYANEA, Lesson, Voy. Coquille, p. 54, pl. vi., f. 3-4. Coogee Bay, May 28, 1889, (W.)
366 V. PACIFICA? Esch., System der Acalephen, p. 174, pl. xiv., f. 4. Coogee Bay, May 28, 1889, (W.)
367 PORPITA SP. Coogee Bay, May 28, 1889, (W.)

SCYPHOMEDUSÆ.

Order CUBAMEDUSÆ.

Family CHORYBDEIDÆ.

368 PROCHARYBDIS FLAGELLATA, Lesson, Prod. 27, and Zoophytes Acephales 1843, p. 278; R. v. Lendenfeld, Cat. Medusæ, Australian Seas, p. 16. P.J.

Order DISCOMEDUSÆ.

Sub-Order SEMOSTOMÆ.

Family CYANIDÆ.

369 STENOPTYCHA ROSEA, Quoy & Gaimard, 1827, Voy. de l'Uranie, Zool., p. 570, pl. lxxxv., f. 1-2; Cat. Medusæ Austr., p. 19. P.J.
370 CYANEA ANNASKALA, R.v.L., Zeits. für Wissen. Zoologie, Bd. XXXVII., p. 465, pl. xxvii.-xxxiii.; Cat. Medusæ Austr., p. 20; P.L.S., N.S.W., Vol. IX., p. 928.

371 var. MARGINATA, R.v.L. November-March, P.J.

Family AURELIDÆ.

372 AURELIA CAERULEA, R.v.L., P.L.S., N.S.W., Vol. IX., p. 281, Cat. Medusæ Austr., p. 22. August-December, P.J. (W.)

Sub-Order RHIZOSTOMÆ.

Family CEPHEIDÆ.

373 PHYLLORHIZA PUNCTATA, R.v.L., P.L.S., N.S.W., Vol. IX., p. 296, pl. iv.; Cat. of the Medusæ of the Australian Seas pt. i., p. 29. March 16, 1889, P.J. (W.)

Family CRAMBESSIDÆ.

374 CRAMBESSA MOSAICA, Q. & G., Voy. de l'Uranie, p. 569, pl., LXXXV., f. 3; R.v.L., Cat. Medusæ Aust., p. 30.

375 var. SYMBIOTICA, R.v.L., l.c., p. 31, and P.L.S., N.S.W., Vol. IX., p. 925. P.J., (W.)

Family LEPTOBRACHIDÆ.

376 LEONURA LEPTURA, Haeckel, Das. Syst. der Medusen, p. 361, P.L.S, N.S.W., Vol. IX., p. 305; Cat. Medusæ Austr. p. 32. November 30, 1885, P.J.

CTENOPHORA.

377 NEIS CORDIGERA, Lesson, Voy. Coquille, p. 10, pl. XVI., f. 2; Lesson, Zoop. Acephales, p. 97; R.v.L., P.L.S., N.S.W., Vol. IX., p. 968; T.-W., P.L.S., N.S.W., Vol. III., 2 Ser., pt. ii., p. 892. March-June, P.J. (W.)

378 BOLINA CHUNI, R.v.L., P L.S., N.S.W., Vol. IX., p. 930, pls. XLIV.-XLV., f. 1-5. August-September, P.J. (W.)

Sub-Kingdom ECHINODERMATA.

Class I. CRINOIDEA.

Family COMATULIDÆ.

1 EUDIOCRINUS SEMPERI, Carpenter, C.R., Vol. XXVI., p. 84, pl. iii., f. 7; pl. vi., f. 1-3. Off P.J.

2 ANTEDON PUMILA, Bell, Zool. "Alert," p. 157, pl. x., f. 3 *a. b.* In the description of this species the first pinnules are said to be the shortest, this is incorrect, the first pinnules are the longest. Very common in deep water, occasionally found under stones, Taylor Bay; Watson's Bay. The stalked or larval form is often found attached to seaweeds. August-September, (W.)

3 A. MACRONEMA, Mull., Monats. d. K. Akad. d. Wiss., 1846, p. 179 ; C.R., Vol. XXVI., p. 212, pl. iv., f. 3 *a-d;* pl. xxxviii., f. 45. Trawled near Sow and Pigs Reef, (Dr. Ramsay.)

4 A. SPINICIRRA, Carpenter, C.R., Vol. XXVI., p. 112, pl. xlvii. Station 164, off P.J.

5 ACTINOMETRA TRICHOPTERA, Val.; Carpenter, C.R., Vol. XXVI., p. 345, pl. v., f. 5 ; pl. lviii. Common under stones at low water, Watson's Bay (W.)

Class II. STELLERIDA.

Order I. OPHIUROIDEA.

Family OPHIURIDÆ.

6 OPHIOPEZA YOLDII, Lutken, Vid. Meddel, Jan. 1856, p. 9 ; Addit ad Hist., pt. ii., p. 98, 1859; Lyman, Bull. Mus. Com. Zool. Vol. III., pt. x., p. 221. Off Twofold Bay, (Challenger).

7 O. FALLAX, Peters, Monatsb. Konig. Akad. Berlin, 1851, p. 465 ; C.R., p. 13, pl. xli., f. 1-3. Dredged in P.J. (Dr. E. P. Ramsay).

8 O. ÆQUALIS, Lyman, C.R., Vol. v., p. 12, pl. xxvii., f. 7, 9. Dredged in P.J. (Dr. E. P. Ramsay.)

9 O. ASSIMILIS, Bell, P.Z.S., 1888, p. 282, pl. xvi., f. 5.

10 PECTINURA ARENOSA, Lyman, C.R., Vol. v., p. 15, pl. xxiii., f. 10-12. Dredged off Green Point, (Dr. E. P. Ramsay).

11 P. GORGONIA, Lutken, Addit. ad. Hist. pt. iii., p. 33, 1869. Dredged off Green Point, (Dr. E. P. Ramsay) ; under stones Watson's Bay (W.)

12 P. MARMORATA, Lyman, Bull. Mus. Com. Zool., Vol. III., pt. x., p. 222, pl. v., f. 1-7. Under stones, Taylor Bay ; Watson's Bay, (W.)

13 P. RAMSAYI, Bell, Proc. Z. Soc., 1888, p. 281, pl. xvi., f. 1. Dredged (Dr. E. P. Ramsay) ; under stones Taylor Bay ; Watson's Bay.

14 OPHIOLEPIS ANNULOSA, M. & Troc., Wiegmann's Archiv., Vol. VI., p. 328, 1840 ; Syst. Aster., p. 89 ; Lutken, Addit ad Hist., pt. ii., p. 100, pl. ii., f. 5 ; Lyman, Ill. Cat. Mus. Com. Zool., No. 1, p. 58. Dredged in P.J. (Dr. Ramsay.)

15 OPHIOGLYPHA KINBERGI, Ljungman ; Lyman, C.R., Vol. v., p. 39, pl. iv., f. 7. Dredged in P.J. (Dr. E. P. Ramsay.)

16 O. MULTISPINA, Ljungman, Oph. Viv. öf. Kong. Akad. p. 307, 1866 ; Lyman, Bull. Mus. Com. Zool., Vol. v., pt. vii., p. 79 ; C.R., p. 41.

17 O. PALLIATA, Lyman, C.R., Vol. v., p. 43, pl. iv., f. 4-6. Station 164 A. Off P.J., 400 fms.

18 O. IRRORATA, Lyman, C.R., p. 47, pl. v., f. 7-9. Station 164 A, off P.J., 400 fms.

19 O. JEJUNA, Lyman, C.R., p. 52, pl. v., f. 4-6. Station 164 A, off P.J., 400 fms.

20 OPHIOMUSIUM FLABELLUM, Lyman, C.R., Vol. v., p. 98, pl. iii., f. 4-6. Off P.J., 30 – 35 fams.

21 OPHIOMASTUS TEGULITIUS, Lyman, C.R., p. 100, pl. viii., f. 16-18. Station 164, off P.J., 950 fms.

22 OPHIACTIS RESILIENS, Lyman, C.R., p. 115, pl. xx., f. 7-9. P.J. ("Challenger.")

23 O. HIRTA, Lyman, C.R., p. 118, pl. xx., f. 4-6. Station 164 A. off P.J., 400 fms.

24 O. SAVIGNII, M. & T., Syst. Ast., p. 95 ; C.R., p. 115. P.J.

25 AMPHIURA CONSTRICTA, Lyman, C.R., p. 131, pl. xvi., f. 11-14. Under stones Watson's Bay, (W.); P.J. 2 – 10 fms., ("Challenger.")

26 A. SQUAMATA, Sars ; Lyman, C.R., p. 136. Station, 163, 120 fms., ("Challenger.")

27 A. PERPLEXA, Stimpson, Proc. Acad. N. Sc. Phil., Vol. VII., 1854, p. 386 ; C.R., p. 144. P.J.

28 A. LOBATA, Ljungman, Oph. Viv. Of. Kong. Akad., 1866, p. 315 ; C.R., p. 148. Near Sydney.

29 OPHIONEREIS SCHAYERI, Mull. & Troch., Wiegman's Archiv., Vol. x., 1884, p. 182. Very common under stones, Watson's Bay.

30 OPHIOCOMA SP. This is a very beautiful species, the general colour being reddish-brown speckled with grey, the spines are ringed with alternating bands of white and brown. Under stones Watson's Bay ; Taylor Bay, (W.)

31 O. SP. A small black species. Dredged in P.J., (Dr. Ramsay).

32 OPHIACANTHA STIMULEA, Lyman, C.R., p. 188, pl. xiii., f. 4-6. Station 164, off P.J.

33 OPHIOTHRIX CAESPITOSA, Lyman, C.R., p. 218, pl. xxvi., f. 12-14. P.J., 2 – 10 fms., (Dr. E. P. Ramsay).

34 O. ARISTULATA, Lyman, C.R., p. 223, pl. xxi., f. 9-12. P.J.

35 O. SPONGICULA, Stimpson, Paoc. Acad. N. Sci., 1855, Vol. VII., p. 385. P.J., (Stimpson.)

36 O. FUMARIA, Mull. & Troch,, Syst. Ast., p. 113, 1842 ; Lyman, Bull. Mus. Com. Zool., Vol. III., pt. x., p. 223, pl. iv., f. 33-36. Under stones, Watson's Bay ; common in deep water, (W.)

37 O. CILIARIS, M. & T., Syst. Ast., p. 114 ; Lyman, Bull. Mus. Com. Zool., Vol. III , pt. x., p. 233, pl. iv., f. 29-3. P.J.

38 OPHIOMYXA AUSTRALIS, Lutken, Addit. ad Hist., pt. iii., p. 99, 1869 ; C.R., p. 246. Under stones, Watson's Bay, (W.)

Family ASTROPHYTIDÆ.

39 GORGONOCEPHALUS AUSTRALIS, Verrill, Contribution to Nat. Hist. of Kergulen Island, by J. H. Kidder, Vol. II., p. 74, 1876; C.R., p. 265. Dredged, P.J., (Dr. E. P. Ramsay.)
40 G. SP. Dredged, P.J., (Dr. E. P. Ramsay.)

Class ASTEROIDEA.

Sub-Class EUASTEROIDEA.

Order PHANEROZONIA.

Family ARCHASTERIDÆ.

41 PONTASTER SUBTUBERCULATUS, Sladen; Challenger Report, Asteroidea, Vol. XXX., 1889, p. 58, pl. v., f. 3-4; pl. xiii., f. 7-8. Station 164, off P.J. 950 fms.
42 PLUTONASTER AMBIGUUS, Sladen, l.c., p. 95, pl. ii., f. 5-6; pl. xiii., f. 11, 12. Station 164, off P.J., 950 fms.

Family ASTROPECTINIDÆ.

43 ASTROPECTEN POLYACANTHUS, M. & T., Syst. Aster. p. 60, pl. v., f. 3; Perr., l.c., Vol. v., p. 275; C.R., Vol. XXX., p. 201. Usually found in deep water, very common everywhere in Port Jackson.
44 A. TRISERIATUS, M. & T., Arch. f. Nat., Bd. I., 1843, p. 117. This is also confined to deep water, Botany Bay, and P.J.
45 A. PECTINATA, Sladen, Jour. of Linn. Soc., London, 1883, Vol. XVII., p. 251; C.R., Vol. XXX,, p. 202, pl. XXXIII., f. 3-4; pl. XXXVII., f. 4-6. Off P.J.
46 PSILASTER ACUMINATUS, Sladen, C.R., Vol. XXX., p. 225, pl. xl., f. 1-2; pl. xlii., f. 7-8. Station 164 off P.J., 950 fms.
47 LUIDIA MACULATA? Mull. & Trochel, System. Aster., p. 77. Coast of New South Wales. There is one specimen in the Australian Museum, the arms are 7 in number and the spread is 18 inches. There are also several large specimens in the Macleay Museum from Jervis Bay.

Family PENTAGONASTERIDÆ.

48 PENTAGONASTER ASTROLOGORUM, M. & T., Syst. Aster. 1842 p. 54; Gray, Synopsis Starfish, Brit. Mus., 1866, p. 11; C. R., Vol. XXX., p. 269. Sydney Harbour, ("Challenger.")
49 P. NOBILIS, Mull. & Trosch., Arch. f. Natur., 1843, Band I., p. 116. Manly Beach.
50 ASTROGONIUM DUBENI, Gray, P.Z.S., 1847, p. 91; Synopsis, 1866, p. 11, pl. iii., f. 2. Under stones, Taylor Bay; Watson's Bay; (W.)

51 A. PULCHELLUM, Gray, Ann. & Mag. N.H., 1840, p. 280; Synopsis, 1866, p. 11, pl. viii., f. 3. New South Wales, ("Challenger.")

52 NECTRIA OCELLIFERA, Lamarck, Anim. sans Vert., 1816, Vol. II., p. 553; Gray, Synopsis, p. 15; Perrier, Revision Stellarides Arch. Zool. Exp., Vol. v., 1876, p. 3; C.R., Vol. XXX., p. 319. Watson's Bay, (Master P. Ramsay.)

53 STELLASTER GRANULOSUS, Perrier, Rev. Stellarides, Arch. Zool. Exp., Vol. v., p. 43. New South Wales, ("Challenger.")

Family ANTHENEIDÆ.

54 ANTHENEA ACUTA, Perrier, Ann. Sci. Naturelles, 1869, 5 Ser., Vol. XII., p. 280; C.R., Vol. XXX., p. 340. Port Jackson, 6 – 15 fms. ("Challenger.")

55 A. FLAVESCENS, Perrier, Arch. Zool. Exp. Revis. Stell., Vol. v., p. 52. Port Jackson, 0 – 5 fms., ("Alert" Report, p. 127). There is some confusion in reference to our single species of *Anthenea*. In the first place Prof. F. Jeffrey Bell (P.L.S., N.S.W., Vol. IX., p. 498) allows it to pass as *A. tuberculosa*, Gray, which however is a northern form not found on our coasts; the same authority in the "Alert" Report sets it down as *A. flavescens*. Whilst Percy Sladen in the Challenger Report refers it to *A. acuta*, and says that the exact habitat of *A. flavescens* is not known.

Family GYMNASTERIDÆ.

56 ASTEROPSIS VERNICINA, Lamarck; Perr., l.c., Vol. v., p. 98; Gray, Synopsis, p. 16, pl. vi., f. 1. *(Petricia punctata.)* Common under stones Chowder Bay; Watson's Bay, (W.)

Family ASTERINIDÆ.

57 PATIRIA CRASSA, Gray, Ann. & Mag. N.H., 1840; Perrier, l.c., Vol. v., p. 246. Dredged at the mouth of Lane Cove River, (Dr. E. P. Ramsay.)

58 PALMIPES? SP. Under stones, Watson's Bay, (W.)

59 ASTERINA CALCAR, Gray, Ann. & Mag. N.H., 1840; Perr., Vol. v., p. 216. Under stones, very common, Middle Harbour; Coogee Bay, (W.)

60 A. GUNNII, Gray, Ann. & Mag. N.H., 1840, p. 289; Perrier, Vol. v., p. 218. Under stones, Watson's Bay; Chowder Bay; and many other places; not so frequent as the preceding species, (W.)

61 A. EXIGUA, Lam., An. S. Vert., t. iii., p. 241; Encycl. Methodique, pl. c., f. 3; Perr., l.c., Vol. v., p. 222. This species is found between high and low water mark in the harbour and all the outer coast, it is the most frequent of

all our Starfishes. The ova of this species are deposited on stones in shallow rocky pools, and are to be found from June to December. They are particularly well adapted for study, inasmuch as after the young leave the egg-case they do not swim away but remain round about the empty egg-cases and never leave until they assume the true star-fish form. The larvæ are remarkably hardy and may be kept in confinement without change of water until they have passed through the larval stages. (W.) *A. regularis* Verrill, is not found in Port Jackson ; the "good series" mentioned in the "Alert" Report are very probably *A. exigua*.

62 A. PENICILLATA, M. & T., System Aster., 1842, p. 42, No. 9. Rare, Watson's Bay ; Rose Bay, (W.)

63 A. SP. Allied to the last but distinct from it. Rare, Rose Bay, (W.)

64 NEPANTHIA BELCHERI, Perrier, l.c., Vol. v., p. 240 ; "Alert," Report, p. 131. P.J.

Order CRYPTOZONIA.

Family STICHASTERIIDÆ.

65 STICHASTER POLYPLAX, M. & T., Arch. f. Natur., 1843 ; Sladen, C.R., Vol. XXX., p. 792. Under stones, Watson's Bay ; Chowder Bay ; Cabbage Tree Bay. Specimens in the harbour are as a rule very small, those from the outside are often much larger. (W.)

Family PTERASTERIIDÆ.

66 RETASTER INSIGNIS, Sladen, Jour. Linn. Soc., London, Vol. XVI., p. 200 ; C.R., Vol. XXX., p. 482, pl. lxxvi., f. 3-4 ; pl. lxxvii., f. 11, 12. Port Jackson ? (fide Bell.)

Family ECHINASTERIDÆ.

67 PLECTASTER DECANUS, M. & T., Arch. f. Nat., 1843, Band I., p. 114, figured in the "Sydney Mail," Nov. 3rd, 1888, p. 936; C.R., Vol. XXX., p. 812. Dredged off Dobroyd Point; off George's Head, (Dr. E. P. Ramsay). Under stones, Shark Island, (Mr. Hunt); Vaucluse Point (Mr. Lea).

Family ASTERIIDÆ.

68 ASTERIAS CALAMARIA, Gray, Ann. & May. N.H., 1840, p. 179; Synopsis, Starfish, Brit. Mus., 1866, p. 1 ; Perrier, Arch. Zool. Exp. Rev. Stell., Vol. IV., p. 307 ; Loriol, Mem. de la Soc. Phy. et Hist. Nat., Geneve, 1884-5, Vol. XXIX., No. 4, pl. vii., f. 12. Very common in deep water and also under stones at low tide, Farm Cove ; Watson's Bay,(W.)

69 UNIOPHRA GLOBIFERA, Gray, Ann. & Mag. N.H., 1840, p. 288; Perrier, l.c., Vol. IV., p. 342. Frequent under stones, Chowder Bay ; Rose Bay ; Taylor Bay, (W.)

Class ECHINOIDEA.

Order ENDCYCLICA.

Sub-Order DESMOSTICHA.

Family CIDARIDÆ.

70 PHYLLACANTHUS AUSTRALIS, Ramsay, Catalogue of Echinodermata in the Australian Museum, p. 3 and 44, pl. i., i.*a*. South Reef 6 fms., P.J. (Dr. E. P. Ramsay).

71 P. PARVISPINUS, Ten.-Woods, P.L.S., N.S.W., Vol. IV., p. 286, pl. xiv., f. A-B. Frequent at Taylor Bay ; Watson's Bay, P.J., (W.)

72 GONIOCIDARIS TUBARIA, Lam., Anim. sans. Vert., p. 57, 1816 ; C.R., Vol. III., p. 49, pl. xl., f. 1-25 ; Agassiz, Revision Echinoidea, part iii., p. 397. 5-8 fms. South Reef and off P.J., (Dr. Ramsay).

73 CENTROSPHEPHANUS RODGERSII, A. Agass., P. Acad. Sci. Phil. 1863, p. 354 ; Rev. Echin., pt. i., p. 98 ; pt. iii., p. 412, pl. iii. *b*, f. 1-3 ; pl. xxiv., f. 37. Common under stones, Watson's Bay, P.J.

74 STRONGYLOCENTROTUS TUBERCULOSUS, Lam., Anim. Sans. Vert. Agass.. Rev. Echin. p. iii., p. 449, pl. v.*b*, f. 4-5 ; pl. xxxvi., f. 4. Rare, Shark Point, P.J., (Mr. Hunt).

75 S. ERYTHROGRAMMUS, Valenc., Voy. of Venus, Zoophytes, pl. vii., f. 1, 1846 ; Agass. Rev. Echin., pt. i., p. 163, pt. iii., p. 441, pl. v.*a*, f. 2-4. Very common under stones, Taylor Bay, and many other places, P.J.

Family ECHINIDÆ.

76 SALMACIS DUSSUMERI, Agass., Ann. Sc. Nat., Vol. vi., Ser. iii., p. 359, 1846 ; A. Agass., Rev. Echin., pt. iii., p. 473, pl. viii. *b*, f. 7-8. P.J.

77 S. ALEXANDRI, Bell, Proc. Zool. Soc., 1880, p. 431, pl. xli., f. 1-7. Frequent in deep water, P.J.

78 S. RARISPINA, Agass. & Desor., Ann. Sc. Nat. Ser. 3, Vol. VI., p. 359 , A. Agass., Rev. Ech., pt. iii., p. 475 ; pl. viii.*b*, f. 4-6. P.J., (Dr. Ramsay.)

79 S. SULCATA, Agass. & Desor., Ann. Sc. Nat., (3) Vol. VI., p. 359 ; A. Agass., Rev. Ech., p. 476, pl. viii.*b*, f. 3, pl. vi., f. 6. P.J., (Dr. Ramsay.)

80 S. WOODSII, Ramsay, Cat. Echinoidea, p. 18 and 47, pl. ii., f. 1, 2, 3. P.J., (Dr. Ramsay.)

81 S. ? sp. Under stones, George's Head, P.J., (Ed. McIntosh).
82 Amblypneustes ovum, Agass. & Desor., Ann. Sc. Nat. (3) Vol. vi., p. 362 ; A. Agass. Rev. Echin., pt. iii., p. 480, pl. viii.*c*, f. 3-4. Frequent in deep water ; often found under stones at low tide, and washed up on sandy beaches Botany ; Coogee ; Chowder ; Watson's Bay, (W.)
83 A. griseus, Blainville, A. Agass., Rev. Echin., pt. iii., p. 480, pl. xxxviii., f. 20-21. Botany.
84 A. formosus, Valenc., Voy. of "Venus," pl. ii., f. 2 ; A. Agas. pt. iii., p. 479, pl. viii.*c*, f. 1-2. Queen's Beach, Botany.
85 Holopneustes purpurascens, Lutken ; A. Agass., Rev. Echin. pt. iii., p. 485, pl. vi., f. 25, 25*a*, pl. viii.*c*, f. 5-6. P.J. (Dr. Ramsay.)
86 Tripneustes angulosus, Leske ; Bell, Proc. Zool. Soc., 1879, p. 657, 661 ; Agass., Rev. Echin., pt. i., p. 135, pt. iii., p. 501, pl. iv.*b*, f. 5-6 ; pl. xxv., f. 6-7. Very rare, Shark Point, P.J., (Mr. Hunt).
87 Evechinus Australiæ, Ten.-Woods, Proc. Linn. Soc., N.S.W., Vol. ii., p. 167. P.J.

Order II. EXOCYLICA.

Sub-Order CLYPEASTRIDA.

Family EUCLYPEASTRIDÆ.

88 Fibularia australis, Desml., Tabl. Syn., 240 ; Agass, Rev. Echin., pt. iii., p. 506, pl. xiiii., f. 9-10 ; C.R., Vol. iii., p. 119. P.J.
89 F. ovulum, Lam., Anim. Sans Vert., p. 17 ; Agass.. Rev. Echin., iii., p. 507, pl. xiii.*e*, f. 1-3. P.J.
90 Echinanthus testudinarius, Gray, P. Zool. Soc., London, p. 35, 1851. P.J.
91 Laganum Peronii, Agass., Int. Mon. Scut., 1841, p. 123, pl. xxii., f. 21-24 ; Agass., Rev. Echin., iii., p. 522, pl. xiii.*e*, f. 4-5.

Sub-Order PETALOSTICHA.

Family SPATANGIDÆ.

92 Maretia planulata, Lam.; Agass., Rev. Echin. iii., p. 570, pl. xix.*b*, f. 7-12 ; pl. xxv., f. 33-34 ; pl. xxvi., f. 21-22 ; pl. xxxvii., f. 13-14 ; C.R., Vol. iii., p. 173, pl. 38, f. 23 ; pl. xl., f. 54, 55 ; pl. xli., 17-20. P.J.
93 Eupatagus Valenciennesii, Agass. & Desor., Ann. des Sci. Nat., Ser. 3, 1847, Vol. viii., p. 9, pl. xvi., (Vol. vi.) f. 13. P.J., (Dr. Ramsay.)
94 Lovenia elongata, Gray, Eyre, Voy. Vol. i. ; C.R., Vol. iii., p. 175, pl. xxxix., f. 13 ; pl. xl., f. 45, 46. P.J.

95 ECHINOCARDIUM AUSTRALE, Gray, Ann. & Mag. N. Hist., Ser. 2, 1851, p. 131. P.J.

96 HEMIASTER APICATUS, Ten.-Woods, P.L.S., N.S.W., Vol. IV., p. 283, pl. xiii., f. 1-5. P.J.

97 BRISSUS CARINATUS, Lam., Agass., Rev. Echin., iii., p. 596, pl. xxi.*a*, f. 1 3, pl. XXV., f. 36-37, pl. xxvi., f. 38. P.J.

98 SCHIZASTER VENTRICOSA, Gray, Ann. & Mag. N.H., (2) Vol. VII., p. 133; Agass., Rev. Echin., iii., p. 614. P.J.

Class IV. HOLOTHURIOIDEA.

Order APODA.

Family SYNAPTIDÆ.

99 SYNAPTA DOLABRIFERA, Stimpson, Proc. Acad. Nat. Sci. Phil. Vol. VII., 1855, p 386; C.R., Vol. XIV., p. 27. Watson's Bay; Neutral Bay, (W.)

100 CHIRODOTA AUSTRALIANA, Stimpson, l.c., p. 386; C.R., Vol. IV., p. 16 and 33. This and the preceding species are usually found together under stones in muddy places, Watson's Bay (W.)

101 C. JAPONICA, Von Marenzeller; C.R., p. 17 and 32. Off Green Point, P.J. (W.)

Order PEDATA.

Family DENDROCHIROTÆ.

102 CUCUMARIA MACULATA, Semper, Holoth., p. 47, pl. xiii., f. 8, pl. XIV., f. 5; C.R., p. 100. P.J.

103 C. MIRABILIS, Theel.; C.R., Vol. XIV., p. 61, pl. ix., f. 5. P.J.

104 COLOCHIRUS SPINOSUS, Q. & G., Astrolabe, Vol. IV., p. 118, pl. vii., f. 1-10; C.R., Vol. XIV., p. 120, pl. xiv., f. 3-4. = *Stereoderma validum*, Bell, Zool. "Alert," p. 150, pl. ix., f. E, *a-f*. Very Common in deep water, P.J.

105 C. AUSTRALIS, Ludwig; C.R., p. 83 and 122, pl. xiv., f. 5-6; pl. vi., f. 6. Under stones, Watson's Bay, P.J. (W.)

106 C. TUBERCULOSUS, Q. & G., Astrolabe, Vol. IV., p. 131; C.R., p. 123. P.J.

Sub-Family GASTROPODA.

107 PSOLUS SP. Off Ball's Head, P.J. (Dr. Ramsay.)

Sub-Family SPORADIPODA.

108 THYONE BUCCALIS, Stimpson, P. Acad. Nat. Sci. Phil., 1855, p. 385; C.R., p. 136. P.J.

109 T. OKENI. Bell, Zool. "Alert," p. 149, pl. ix., f. D; C.R., p. 139. P.J.

110 PHYLLOPHORUS PERSPICILLUM, Selenka, Zeits. fur Zoologie, Bd. XVII., p. 352, pl. XX., f. 110-111; C.R., p. 150. In the Challenger Report there is a query as to whether this species belongs to the genus *Orcula* or to *Phyllophorus*. I have seen the inner alternating circle of tentacles so that it belongs to the latter genus. Off Shark Point, P.J.

111 P. IMCOMPERTUS, Theel., C.R., p. 97, pl. v., f. 3; pl. viii., f. 5. P.J.

Family ASPIDOCHIROTÆ.

112 HOLOTHURIA SP. Vaucluse Point, (Mr. Rowsell).

Order ELASIPODA.

Family DEIMATIDÆ.

113 LAETOGONE VIOLACEA, Theel., C.R., Vol. IV., p. 78, pl. 13. Station 164, off P.J. ("Challenger.")

114 PANNYCHIA MOSELEYI, Theel., C.R., Vol. IV., p. 88, pl. 17. Station 164 off P.J., ("Challenger.")

Sub-Kingdom VERMES.

Class I. PLATYHELMINTHES.

Order I. TURBELLARIA.

DENDROCŒLA.

Family PLANARIIDÆ.

1 POLYCELIS AUSTRALIS, Schmarda, Neue, Wirbellose Thiere, 1859, Vol. I., p. 21, pl. iv., f 45. Illawarra.

Family EURYLEPTIDÆ.

2 THYSANOZOON CRUCIATUM, Schmarda, l.c., p. 30, pl. vi., f. 68. P.J.

3 T. AUSTRALE, Stimpson, Proc. Acad. Nat. Sci., Phil., 1855, Vol. VII., p. 289. Under stones, Taylor Bay; Watson's Bay, (W.)

Family ? ?

4 DIONCUS BADIUS, Stimpson, l.c., p. 389. P.J.

5 D. OBLONGUS, Stimpson, l.c., p. 389. P.J.

RHYNCHOCŒLA.

Family CARINELLIDÆ.

6 POLIA RHOMBOIDALIS, Stimpson, l.c., p. 390. P.J.

7 BORLASIA VIRIDIS, Quoy & Gaim., Voy. Astrolabe, Vol. IV., p. 288, pl. xxiv., f. 9-11. P.J.
8 MECKELIA AUSTRALIS, Stimpson, P. Acad. N. Sci. Phil., 1857, p. 161. P.J.
9 M. SP. A very pretty species marked with red and white lines. Taylor Bay.

Class II. NEMATELMINTHES.

Order NEMATODA.

I am not aware of any described species of this order from Port Jackson, but Dr. N. Cobb, informs me that free swimming Nematodes are found, and no doubt there are many species to be worked out.

CHAETOGNATHA.

10 SAGITTA SP. In rock pools Neutral Bay, (Mr. Hewett). Common on the surface near the Heads, P.J., (W.)

Class III. ANNELIDA.

Sub-Class CHAETOPODA.

Order I. POLYCHAETA.

Sub-Order ERRANTIA.

Family AMPHINOMIDÆ.

11 AMPHINOME SP. P.J.
12 HIPPONŒ GAUDICHAUDII, Audouin & Edwards; McIntosh, C.R., Vol. XII., p. 30, pl. i., f. 5, pl. iv., f. 3, pl. iii.*a*, f. 13-17. P.J.

Family APHRODITIDÆ.

13 APHRODITA AUSTRALIS, Baird, Jour. Linn. Soc., London, Vol. VIII., p. 176; McIntosh, C.R., p. 34, pl. vii., f. 6-7, pl. vi.*a*, f. 4-7. P.J.

Family POLYNOIDÆ.

14 LEPIDONOTUS STRIATUS, Kingberg, Ofversigt af K. Vetensk. Akad. Forhandlingar, 1855, p. 381. P.J.
15 L. JACKSONI, Kinberg, l.c., d. 383. P.J.
16 L. DICTYOLEPIS, Haswell, P.L.S., N.S.W., Vol. VII., p. 287, pl. ix., f. 7-8. Dredged in shallow water, Watson's Bay, (Dr. Haswell).

17 Polynoe australis, Schmarda, Neue. Wirb. Thiere, pt. ii., p. 154, Woodcut *a*, *b*, *b'*. P.J.

18 Thormora argus, Val.; Quartrefages, Hist. Nat. des Anneles Vol. i., p. 247. P.J.

19 Antinoe Wahlii, Kinberg, l.c., p. 19, pl. vi., f. 28, pl. x., f. 55. P.J.

20 A. praeclera, Hasw., Proc. Linn. Soc., N.S.W., Vol. vii., p. 290, pl. ix., f. 10-12. Among Mussels at low tide, (Dr. Haswell).

21 A. ascidiicola, Hasw., l.c., p. 291, pl. ix., f. 16. In an Ascidian obtained in the trawl at the mouth of the Parramatta River.

22 A. pachylepis, Hasw., l.c., p. 292, pl. ix., f. 17. Under stones near high water mark, P.J., (Dr. Haswell).

Family SIGALIONIDÆ.

23 Thalenessa fimbriata. McIntosh, C.R., Vol. xii., p. 144, pl. xix., f. 10 ; pl. xxiii., f. 4 ; pl. xxiv., f. 5 ; pl. xxv., 1-2 ; pl. xiii.*a*, f. 13. Off P.J.

Family NEPHTHYDIDÆ.

24 Nephthys longipes, Stimpson, P. Acad. Nat. Sci., Phil., 1854-55, Vol. vii., p. 392. Botany Bay.

Family PHYLLODOCIDÆ.

25 Phyllodce duplex, McIntosh, C.R., Vol. xii., p. 167, pl. xxvii., f. 8 ; pl. xxxii., f. 9 ; pl. xv.*a*, f. 1. Station 163, (Challenger).

26 P. Novæ-Hollandiæ, Kinberg, Ofversigt af K. Vetensk-Akad. Forhandlungar, 1865, p. 241. P.J. 12 fms.

27 Eulalia quadrocula, Hasw., P.L.S., N.S.W., Vol. x., p. 748, pl. liii., f. 6-9. Dredged in P.J., (Dr. Haswell).

Family HESIONIDÆ.

28 Cirrosyllis didymœcera, Schmarda, l.c., pt. ii., p. 77, pl. xxviii., f. 224. P.J.

29 Psamathe? crinita, Haswell, l.c., Vol. x., p. 749, pl. liii., f. 10-12. Dredged in P.J., (Dr. Haswell).

Family SYLLIDÆ.

30 Syllis corruscans, Hasw., l.c., Vol. x., p. 734, pl. l., f. 1-3, pl. lv., f. 5. Littoral, extending to 15 fms., P.J., (Dr. Haswell.)

31 S. Kinbergiana, Hasw., l.c., Vol. x., p. 739, pl. li., f. 1-3. Among Mussels and Ascidians, P.J., (Dr. Haswell).

32 S. taeniaeformis, Hasw., l.c., Vol. x., p. 741, pl. l., f. 4-5. Obtained in the trawl in a few fathoms, P.J., (Dr. Haswell).

33 S. SCHMARDIANA, Hasw., l.c., Vol. x., p. 742, pl. li., f. 4-8. P.J.
34 S. NIGROPUNCTATA, Hasw., l.c., Vol. x., p. 743, pl. lii, f. 1-3. Under stones, Neutral Bay, (Dr. Haswell).
35 THOE FUSIFORMIS, Kinberg, l.c., 1865, p. 249. P.J.
36 EURYMEDUSA PICTA, Kinberg, l.c., 1865, p. 249. P.J.
37 GNATHOSYLLIS ZONATA, Hasw., l.c., Vol. x., p. 746, pl. lii., f. 4-6., P.J.?

Family NEREIDÆ.

38 NEREILEPUS AMBLYODONTA, Schmarda, l.c., pt. ii., p. 106, pl. xxxi., f. 245. P.J.
39 NEREIS JACKSONI, Kinberg, l.c., 1865, p. 169. Under stones at low tide, P.J.
40 N. LANGUIDA, Kinberg, l.c., 1865, p. 169. 12 fms. P.J.
41 NEANTHES VAALII, Kinberg, l.c., 1865, p. 171. Under stones at low tide, P.J.
42 PERINEREIS NOVÆ-HOLLANDIÆ, Kinberg, l.c., 1865, p. 175. 8-10 fms., P.J.

Family ??

43 HALLA AUSTRALIS, Haswell, P.L.S., N.S.W., Vol. x., p. 752, pl. liv., f. 6-7 ; pl. lv., f. 1-4. P.J.

Family STAUROCEPHALIDÆ.

44 STAUROCEPHALUS AUSTRALIS, Hasw., l.c., Vol. x., p. 747, pl. liii., f. 1-5. Among Mussels at low tide, P.J., (Dr. Haswell).
45 S. LOVENII, Kinberg, l.c., 1864, p. 574. 12 fms., P.J.

Family LUMBRINEREIDÆ.

46 NOTOCIRRUS BREVICIRRUS, Schmarda, l.c., pt. ii., p. 117.
47 LUMBRICORNEREIS MIRABILIS, Kinberg, l.c., 1864, p. 568. Near P.J., 12 fms.
48 L. JACKSONI, Kinberg, l.c., 1864, p. 569. P.J.

Family EUNICIDÆ.

49 EUNICE APHRODITOIS, Pall. ; McIntosh, C.R., Vol. XII., p. 282, pl. xxxviii., f. 16-17 ; pl. xx., f. 8-10.
50 DIOPATRA DENTATA, Kinberg, l.c., 1864, p. 560. 12 fms. P.J.
51 NAUPHANTA NOVÆ-HOLLANDIÆ, Kinberg, l.c., 1864, p. 564. P.J.
52 LYSIDICE BREVICORNIS, Kinberg, l.c., 1864, p. 566. P.J.
53 L. ROBUSTA, Stimpson, P. Acad. N. Sci., Phil., 1854-55, p. 392. P.J.

Family ARICIIDÆ.

54 Labotus Novæ-Hollandiæ, Kinberg, l.c., 1865, p. 252. P.J. 12 fms.
55 Scoloplos sp. Neutral Bay.
56 Aricia sp. P.J.

Family OPHELIIDÆ.

57 Polyophthalmus sp. Off Green Point, P.J.

Family CHAETOPTERIDÆ.

58 Chaetopterus luteus, Stimpson, P. Acad. N. Sci., Phil., 1854-55, p. 391. P.J.
59 C. macropus, Schmarda, l.c., pt. ii., p. 17, pl. xi., f. 167. P.J.

Family CIRRATULIDÆ.

60 Cirratulus Australis, Val., Quartrefages Hist. Nat. Ann., Vol. i., p. 457. P.J.? Jervis Bay.
61 Timarete fecunda, Kinberg, l.c., 1865, p. 254. Surface, P.J.
62 Tratisia lithophila, Kinberg, l.c., 1865, p. 256. P.J., 12 to 20 fms.

Family MALDANIDÆ.

63 Clymene integrinatus, Hasw., P.L.S., N.S.W., Vol. vii., p. 634, pl. xii., f. 3-6. Among sand and shingle, P.J., (Dr. Haswell).

Family AMMOCHARIDÆ.

64 Ammochares tenuis, Hasw., l.c., Vol. vii., p. 633, pl. xii., f. 2. Under stones at low tide (Dr. Haswell).

Family PHERUSIDÆ.

65 Siphonostoma affine, Haswell, l.c., Vol. x., p. 750, pl. liv., f. 1-5. Obtained in the trawl, P.J., (Dr. Haswell).

Family HERMELLIDÆ.

66 Sabellaria Girardi, McIntosh, C.R., Vol. xii., p. 421, pl. xlvii., f. 7, pl. xxvii.*a*, f. 13-15. Off P.J.

Family AMPHICTENIDÆ.

67 Pectinaria antipoda, Schmarda, l.c., pt. ii., p. 46, pl. xxiv., f. 199, 199*a*. P.J.

Family TEREBELLIDÆ.

68 Terebella Grubei, McIntosh, C.R., Vol. xii., p. 445, pl. xlix., f. 2; pl. xxvii.*a*, f. 20. Station 163.
69 T. modesta, Quatrefages, Hist. Nat. Annales, pt. ii., Vol. ii., p. 365. P.J.? Jervis Bay.

70 T. TRIGONOSTOMUM, Schmarda, l.c., pt. ii., p. 44, pl, xxv., f. 203. New South Wales Coast.
71 T. (LANICE) FLABELLUM, Baird; McIntosh, C.R., Vol. XII., p. 446, pl. xlix., f. 3, pl. l., f. 1, pl. xxvii.*a*, f. 22. Off Green Point, P.J.
72 RHYTOCEPHALUS EBRANCHIATUS, Quatrefages, l.c., pt. ii., p. 392. Jervis Bay.

Family SABELLIDÆ.

73 SABELLA FUSCA, Grube; McIntosh, C.R., Vol. XII., p. 491, pl. lii., f. 3, pl. xxx.*a*, f. 4-6. Off P.J.
74 S. VELATA, Hasw., P.L.S., N.S.W., Vol. IX., p. 671, pl. xxxi., f. 8, pl. xxxiv., f. 1-4. Under stones P.J., (Dr. Haswell).
75 S. PUNCTULATA, Haswell, l.c., Vol. IX., p. 672. Near low water mark, P.J., (Dr. Haswell).
76 SPIROGRAPHIS AUSTRALIENSIS, Haswell, l.c., Vol. XI., p. 673. Watson's Bay, near low water mark, P.J., (Dr. Haswell).

Family SERPULIDÆ.

77 SALMACINA AUSTRALIS, Haswell, l.c., Vol. IX., p. 669, pl. xxxiii., f. 7-11. Under stones, P.J., (Dr. Haswell).
78 EUPOMATUS ELEGANS, Haswell, l.c., Vol. VII., p. 633, pl. xii., f. 1; Vol. IX., p. 660, pl. xxxi., f. 3-4; pl. xxxii., f. 11-12; pl. xxxiii., f. 1-6. Off Green Point, 6–10 fms., (Dr. Haswell).
79 SERPULA VASIFERA, Haswell, l.c., Vol. IX., p. 668, pl. xxxi., f. 6, pl. xxxii., f. 6-2. Under stones, Watson's Bay, (Dr. Haswell).
80 POMATOCERUS ELAPHUS, Haswell, l.c., Vol. IX., p. 663, pl. xxxi., f. 7, pl. xxxii., f. 9-10. P.J.
81 VERMILIA CAESPITOSA, Lam.; Haswell, l.c., Vol. IX., p. 665, pl. xxxi., f. 5, pl. xxxii., f. 1-2. Very common, on rocks and stones, P.J.
82 V. ROSEA, Haswell, l.c., Vol. IX., p. 667, pl. xxxii., f. 2-5. Under stones, Watson's Bay.

Sub-Class II. GEPHYREA.

A. CHAETIFERA.

83 THALASSEMA SP. Off Green Point, P.J.
84 BONELLIA SP. See P.L.S., N.S.W., Vol. X., p. 331. Under stones, Neutral Bay; Mossman's Bay, P.J.

B. ACHAETA.

85 PHASCOLOSOMA AUSTRALIS, Kefferstein, Beitrage zur Anatom. und Syst. Kenntniss der Sipunculiden, Gottengen Nachricten, 1865, p. 197. Sydney, (Dr. Schutte).

86 P. NODULIFERA, Stimpson, P. Acad. N. Sci., Phil., 1885, Vol. VII., p. 390. P.J.

87 PHYMOSOMA JAPONICA, Grube, 54th Jahresbericht der Schlesischen Geselleschaft fur vaterlandische Cultur, Breslau, 1877, p. 73 ; C.R., Vol. XIII., p. 21. Very common under stones , Neutral Bay ; Watson's Bay.

88 SIPUNCULUS SP. P.J.

Sub-Class III. HIRUDINEA.

Family RHYNCOBDELLIDÆ.

89 *BRANCHELLION SP. P.J.

90 EUBRANCHELLA SP. P.J.

91 PONTOBDELLA LEUCOTHELA, Schmarda, Neue Wirbellose Thiere p. 6, pl. xvi., f. 146. P.J.

Class IV. ROTIFERA.

92 SYNCHAETA SP. Among weeds, Callan Park Jetty, Parramatta River.

Sub-Kingdom ARTHROPODA.

Class I CRUSTACEA.

I. ENTROMOSTRACA.

Order I. PHYLLOPODA. ρ

PHYLLOCARIDEA.

1 PARANEBALIA LONGIPES, Willemoes Suhm, Trans. Linn. Soc., London, Vol. I., Ser. 2, p. 26, pl. vi. ; Sars, in C.R., Vol. IX., p. 10, pl. x., f. 1-11. Dredged in P.J., off Green Point, (Dr. Ramsay). Previously only known from Bermuda.

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* The following species have been described from South-West and West Australia, by Dr. Baird, P.Z.S., London, 1869, p. 311–313 :—

BRANCHELLION LINEARE, Baird ; on Mustelus, King George's Sound.

B. PUNCTATA, Baird ; on Myliobatus, King George's Sound.

EUBRANCHELLA BRANCHIATA, Menzies, Trans. Linn. Soc., Vol. I., p. 188, pl. xvii., f. 3 (1791). On a turtle, Shark's Bay.

PONTOBDELLA RAYNERI, Baird ; on Rhinobatus, Shark's Bay. It is probable the Port Jackson species may be identical with those enumerated above.

Order OSTRACODA.

Family CYPRIDÆ.

2 PHLYCTENOPHIA ZEALANDICA, Brady ; C.R., Vol. I., 1880, p. 33, pl. iii., f. 1 *a-m*. P.J.
3 PONTOCYPRIS SUBRENIFORMIS, Brady, C.R., p. 38, pl. xv., f. 6 *a-a*. P.J.
4 ARGILLAECIA BADIA, Brady, C.R., p. 40, pl. vi., f. 3 *a-a*. P.J.
5 MACROCYPRIS SETIGERA, Brady, C.R., p. 43, pl. i., f. 1 *a-a*. P.J.
6 BAIRDIA FUSCA, Brady, C.R., p. 49, pl. vii., f. 2 *a-d* ; Trans. Z. Soc., 1865, Vol. v., p. 34, pl. lvii., f. 9 *a-d*. P.J.
7 B. MINIMA, Brady, C.R., p. 53, pl. vii., f. 6 *a-g*, f. *e* and *g*, from P.J.
8 B. VICTRIX, Brady, Les Fonds de la Mer., Vol. I., p. 162, pl. xvii., f. 17, 18 ; C.R., p. 56, pl. x., f. 5 *a-d*. P.J.

Family CYTHERIDÆ.

10 CYTHERE VELLICATA, Brady, C.R., p. 64, pl. xii., f. 2 *a-d*. P.J.
11 C. DEMISSA, Brady, Ann. & Mag. N. H., 1868, (4) Vol. II., p. 180, pl. xii., f. 12 ; C.R., p. 66, pl. xii., f. 7 *a-j*. P.J.
12 C. CUMULUS, Brady, C.R., p. 71, pl. xiii., f. 2 *a-d*. P.J.
13 C. CRISPATA, Brady, C.R., p. 72, pl. xiv., f. 8 *a-d*. P.J.
14 C. CANALICULATA, Reuss, Haidingers Abhand. 1850, Bd. III., p. 76, pl. ix., f. 12 ; C.R., p. 73, pl. xiv., f. 7 *a-d*. P.J.
15 C. KERGUELENENSIS, Brady, C.R., p. 78, pl. iv., f. 1 *a-f*. P.J.
16 C. GOUJONI, Brady, C.R., p. 96, pl. xxv., f. 7 *a-y*. P.J.
17 C. DICTYON, Brady, C.R., p. 99, pl. xxi.v, f. 1 *a-y*. Off P.J.
18 C. DASYDERMA, Brady, C.R., p. 105, pl. xvii., f. 4 *a-f* ; pl. xviii. f. 4 *a-f*. P.J.
19 C. CLAVIGERA, Brady, C.R., p. 105, pl. xxiii., f. 7 *a-d*. P.J.
20 C. TRICRISTATA, Brady, C.R., p. 110, pl. xxiii., f. 6 *a-d*. P.J.
21 KRITHE PRODUCTA, Brady, C.R., p. 114, pl. xxvii., f. 1 *a-j*. Off P.J.
22 LOXOCONCHA AVELLANA, Brady, C.R., p. 117, pl. xxviii., f. 1 *a-f*. P.J.
23 L. AUSTRALIS, Brady, C.R., p. 119, pl. xxviii., f. 5 *a-f* ; pl. xxix. f. 3 *a-d*. P.J.
24 XESTOLEBERIS GRANULOSA, Brady, C.R., p. 125, pl. xxx., f. 5 *a-d*. P.J.
25 X. CURTA, Brady, C.R., p. 126, pl. xxxi., f. 6 *a-d*. P.J.
26 CYTHERURA CURVISTRIATA, Brady, C.R., p. 131, pl. xxxii., f. f. 10 *a-d*. P.J.

Family CYTHERELLIDÆ.

28 CYTHERELLA PULCHRA, Brady, C.R., p. 174, pl. xliv., f. 3 *a-b*. P.J.

29 C. PUNCTATA, Brady, C.R., p. 174, pl. xxxiv., f. 6 *a-b* ; pl. xliv., f. *a-g*. P.J.

Order III. COPEPODA.

Family CALANIDÆ.

29 CALANUS GRACILIS, Dana, U.S. Expl., Crust., 1078, pl. xxiv., f. 10 ; Brady, C.R., Vol. VIII., p. 35, pl. v., f. 1-6 ; pl. xlvi. P.J.

30 EUCALANUS ATTENUATUS, Dana, l.c., pl. lxxv., f. 1 ; C.R., l.c., p. 38, pl. vi., f. 1-8 ; pl. ii., f. 8-10. Off P.J.

31 PLEUROMMA ABDOMINALE, Claus. ; Brady, l.c., p. 46, pl. xi., f. 1-13 ; pl. xii., f. 1-16 ; pl. xxxi.; f. 13-14. Off P.J.

32 LEUCKARTIA FLAVICORNIS, Claus. ; Brady, C.R., p. 50, pl. xv., f. 1-9 and 16. Off P.J.

33 UNDINA VULGARIS, Dana ; C.R., p. 53, pl. xv., f. 11-15 ; pl. xviii., f. 6. Off P.J.

34 U. DARWINI, Lubbock, Trans. Linn. Soc., London, Vol. XXIII., p. 179, pl. xxix., f. 4-5 ; C.R., p. 54, pl. xvi., f. 1-4, 6-14. Off P.J.

35 SCOLECITHRIX DANÆ, Lubbock, Trans. Ent. Soc., Vol. IV., 1856, p. 15, pl. ix., f. 6-9 ; C.R., p. 57, pl. xvii., f. 1-12. Off P.J.

36 EUCHÆTE PRESTANDREÆ, Philippi ; Brady, C.R., p. 60, pl. xviii., f. 7-15, pl. xix. Off P.J.

37 CANDACE PECTINATA, Brady, C.R., p. 67, pl. xxx., f. 1-13. Off P.J.

38 C. PACHYDACTYLA, Dana ; Brady, C.R., p. 68, pl. xxxi., f. 2-9. Off P.J.

39 ÆTIDIUS ARMATUS, Brady, C.R., p. 76, pl. x., f. 5-16. Off P.J.

40 TEMORA DUBIA, Lubbock, Tran. Ent. Soc., 1856 ; C.R., p. 79, pl. XXV., f. 1-17. Off P.J.

41 CENTROPAGUS FURCATUS, Dana; Brady, C.R., p. 83, pl. xxviii., f. 1-11. Off P.J.

42 PONTELLA ACUTA, Dana ; Brady, C.R , p. 89, pl. xxxvi., f. 1-12. Off P.J.

43 P. ACUTIFRONS, Dana ; Brady, C.R., p. 81, pl. xxxv., f. 1-13. Off P.J.

44 P. PLUMATA, Dana ; Brady, C.R., p. 92, pl. xxxvii., f. 1-11. Off P.J.

Family CYCLOPIDÆ.

45 OITHONA CHALLENGERII, Brady, C.R., p. 97, pl. xl., f. 1-10. Off P.J.

Family CORYCAEIDÆ.

46 CORYCAEUS VARIUS, Dana ; Brady, C.R., p. 111, pl. lii., f. 1-14. Off P.J.

47 ONCAEA OBTUSA, Dana ; Brady, C.R., p. 120, pl. li., f. 1-11. Off P.J.

Family SAPHIRINIDÆ.

48 SAPHIRINA SPLENDENS, Dana ; Brady, C.R., p. 127, pl. xlix., f. 11-13. Off P.J.

Order IV. CIRRIPEDIA.

Family I. BALANIDÆ.

Sub-Family BALANINÆ.

49 BALANUS TINTINNABULUM, Linn. ; Darwin, Monograph of the Cirripedia, (Ray Society) London, 1851-1854, Vol. II., p. 194, pl. i., figs. a, l ; pl. ii., fig. 1 a, o. Sydney.
50 B. TRIGONUS, Darwin, l.c., p. 223, pl. iii., figs. 7 a, 7 f ; Hoek., C.R., Vol. VIII., (1883) p. 149, pl. xii., f. 20. P.J.
51 B. VESTITUS, Darwin. l.c., p. 286, pl. vii., f. 3a-b. P.J.
52 B. IMPERATOR, Darwin, l.c., p. 288, pl. viii., f. 4a, 4c. P.J.
53 ACASTA SULCATA, Lamarck ; Darwin, l.c., p. 310, pl. ix., figs. 2a-2d. P.J.
54 A. GLANS, Lamarck ; Darwin, l.c., p. 314, pl. ix., f. 5a-5c. P.J.
55 TETRACLITA ROSEA, Darwin, l.c., 335, pl. x., f. 3a, 3d. P.J.
56 T. RADIATA, Blainville ; l.c., p. 343, pl. xi., f. 5 a-d. P.J.
57 T. POROSA, Gmelin ; Darwin, l.c., p. 329, pl. x., f. 1a-1m. P.J.
58 ELMINUS PLICATUS, Gray ; Darwin, l.c., p. 351, pl. xii., f. 2a-2f. P.J.
59 E. SIMPLEX, Darwin, l.c., p. 353, pl. xii., f. 3. P.J.
60 E. MODESTUS, Darwin, l.c., p. 350, pl. xii., f. 1a, 1e. P.J.
61 TUBICINELLA TRACHEALIS, Shaw ; Darwin, l.c., p. 431, pl. XVII., f. 3a, 3e. N.S.W.

Sub-Family II. CHTHAMALINÆ.

62 CHTHAMALUS ANTENNATUS, Darwin, l.c., p. 460, pl. xviii., f. 2. P.J.
63 CHAMAESIPHO COLUMNA, Spengler ; Darwin, l.c., p. 470, pl. xix., f. 3a, 3e. P.J.
64 PACHYLASMA AURANTIACUM, Darwin, l.c., p. 480, pl. xx., f. 1a, 1d. P.J.
65 CATOPHRAGMUS POLYMERUS, Darwin, l.c., p. 487, pl. xx., f. 4a, 4e. N.S.W.

Family II. LEPADIDÆ.

66 LEPAS HILLII, Leach ; Darwin, l.c., Vol. I., p. 77, pl. i., f. 2. P.J.
67 L. ANSERIFERA, Linn. ; Darwin, l.c., p. 81, pl. i., f. 4. P.J.

68 L. PECTINATA, Spengler ; Darwin, l.c., p. 85, pl. i., f. 3. Common on shells of *Spirula Peronii*, Bondi.
69 L. AUSTRALIS, Darwin, l.c., p. 89, pl. i., f. 5. P.J.?
70 PÆCILASMA FISSA, Darwin. On the feet of *Clibanarius strigimanus*, (an hermit crab). Off P.J.
71 P. GRACILE, Hoek., C.R., Vol. VIII., p. 46, pl. ii., f. 2-4. Off P.J.
72 DICHELASPIS ORTHOGONIA, Darwin, l.c., p. 130, pl. ii., f. 10. Off Ball's Head, on the stem of Virgularia. (Dr. Ramsay.)
73 PARADOLEPAS NEPTUNI, Macdonald, P.Z.S., 1869, p. 440, pl. 33-34. On the gills of various crabs, P.J.
74 ALEPAS PEDUNCULATA, Hoek., C.R., Vol. VIII., p. 57, p. iii., f. 10-11. Off P.J.
75 IBLA QUADRIVALVIS, Cuvier ; Darwin, l.c., p. 203, pl. iv., f. 9. This species possesses supplementary males ; it is very common under stones at Watson's Bay and many other places. (W.)
76 SCALPELLUM PERONII, Gray ; Darwin, l.c., p. 246, pl. vi., f. 6. Off Ball's Head, P.J. (W.)
77 LITHOTRYA CAUTA, Darwin, l.c., p. 356, pl. vii., f. 3. N.S.W.

II. MALACOSTRACA

Order I. ARTHROSTRACA.

Sub-Order I. Amphipoda.

Family ORCHESTIDÆ.

78 TALORCHESTIA QUADRIMANA, Dana, U.S. Expl. Exp., Crust. II. p. 8J9, pl. lix., f. 7 ; Cat. Crust., p. 216, no 394. Bondi.
79 ORCHESTIA MACLEYANA, Haswell, P L.S., N.S.W., Vol. IV., p. 250, pl. vii., f. 2 ; Cat. Crust. p. 220, no. 401. Sandy beaches, P.J.
80 ALLORCHESTIA HUMILIS, Dana, U.S. Expl. Exp., Crust. II., p. 890, pl. lix., f. 6 ; Cat. Crust., p 221, no. 403. P.J.
81 A. RUPICOLA, Haswell, l.c., Vol. IV., p. 250, pl. viii., f. 1 ; Cat. Crust., p. 222, no. 406. P.J.
82 A. NIGER, Haswell, l.c., p. 319 ; Cat. Crust., p. 224, 408. P.J.

Family GAMMARIDÆ.

83 MONTAGUA MIERSII, Haswell, l.c., p. 323, pl. xxiv., f. 4 ; Cat. Crust., p. 226, no. 410. P.J.
84 M. LONGICORNIS, Haswell, l.c., p. 323, pl. xxiv., f. 5 ; Cat. Crust., p. 226, no. 411. P.J.
85 AMARYLIS BREVICORNIS, Haswell, l.c., p. 254 ; Cat. Crust., p. 228, no. 414. P.J.
86 CYPROIDIA ORNATA, Haswell, l.c., p. 320, pl. xviii., f. 1 ; Cat. Crust., p. 230, no. 416. P.J.

87 C. LINEATA, Haswell, l.c., p. 321, p. xviii., f. 2 ; Cat. Crust., p. 230, no. 417. P.J.

88 LYSIANASSA NITENS, Haswell, l.c., p. 255, pl. viii., f. 5 ; Cat. Crust., p. 232, pl. iv., f. 1, no. 418. P.J.

89 L. AFFINIS, Haswell, l.c., p. 255 ; Cat. Crust., p. 232, pl. iv., f. 2, no. 419. P.J.

90 GLYCERINA TENUICORNIS, Haswell, l.c., p. 256, pl. viii., f. 6 ; Cat. Crust. pl. iv., f. 6, no. 422. P.J.

91 AMPELISCA AUSTRALIS, Haswell, l.c., p. 257, pl. viii., f. 3 ; Cat. Crust., p. 235, no. 423. P.J.

92 PHOXUS VILLOSUS, Haswell, l.c., p. 258, pl. ix., f. 2 ; Cat. Crust., p. 236, no. 424. P.J.

93 P. BATEI, Haswell, l.c., p. 259, pl. ix., f. 3 ; Cat. Crust., p. 237, no. 525. P.J.

94 ŒDICERUS FOSSOR, Stimp., P. Acad. N. Sci., Phil., 1855; Cat. Crust., p. 238, no. 426. Botany Bay.

95 Œ. LATRANS, Haswell, l.c., p. 324, pl. xix., f. 1 ; Cat. Crust., p. 239, no. 427. Bondi.

96 Œ. ARENICOLA, Haswell, l.c., p. 325, pl. xxiv., f. 3 ; Cat. Crust., p. 239, no. 428. P.J.

97 UROTHOE PINGUIS, Haswell, l.c., p. 325, pl. xix., f. 2 ; Cat. Crust. p. 240, no. 429. Bondi.

98 IMPHIMEDIA AMBIGUA, Haswell, l.c., p. 327, pl. xxiv., f. 2 ; Cat. Crust. p. 241, no. 430. Dredged, P.J.

99 ATYLUS MONOCULOIDES, Haswell, l.c., p. 327, pl. xviii., f. 4 ; Cat. Crust., p. 243, no. 431. P.J.

100 A. LIPPUS, Haswell, l.c., p. 328, pl. xx., f. 1 ; Cat. Crust., p. 243, no. 432. P.J.

101 A. MICRODEUTEROPUS, Haswell, l.c., Vol. v., p. 102, pl. vi., f. 3 ; Cat. Crust., p. 244, no. 433.

102 A. MAGALOPHTHALMUS, Haswell, l.c., Vol. v., p. 102, pl. vi., f. 4 ; Cat. Crust., p. 244, no. 434. P.J.

103 A. AUSTRINUS, Spence Bate, Cat. Amphipoda, p. 137, pl. xxvi., f. 4 ; Cat. Crust., p. 245, no. 435. P.J.

104 PHERUSA AUSTRALIS, Haswell, l.c., p. 103, pl. vii., f. 1 ; Cat. Crust., p. 246, no. 437. Botany Bay.

105 EUSIRUS DUBIUS, Haswell, l.c., Vol. iv., p. 331, pl. xx., f. 3; var. l.c., Vol. x., p. 100 ; Cat. Crust., p. 247, no. 438. P.J.

106 LEUCOTHOE COMMENSALIS, Haswell, l.c., Vol. iv., p. 261, pl. x., f. 3 ; Cat. Crust., p. 248,, no. 439 P.J.

107 L. NOVÆ-HOLLANDIÆ, Haswell, l.c., Vol. iv., p. 329, pl. xvii., f. 2 ; Cat. Crust., p. 250, no. 442. P.J.

108 HARMONIA CRASSIPES, Haswell, l.c., p. 330, pl. xix., f. 3 ; Cat. Crust., p. 251, 443. P.J.

109 MELITA AUSTRALIS, Haswell, l.c., p. 252, pl. ix., f. 6-7 ; Cat. Crust., p. 252, no. 444. P.J.

110 Mœra rubro-macullta, Stimpson, P. Acad. N. Cci., Phil., 1855; Cat. Crust., p. 254, no. 446; P.L.S., N.S.W., Vol. x., p. 105 P.J.
111 M. hamigera, Haswell, l.c., p. 333, pl. xxi., f. 1; Cat. Crust., p. 254, no. 447. P.J.
112 M. viridis, Haswell, l.c., p. 333, pl. xxi., f. 2; Cat. Crust., p. 255, no. 448. P.J.
113 M. dentifera, Haswell, l.c., p. 332, pl. xx., f. 4; Cat. Crust., p. 256, no. 549. P.J.
114 M. approximans, Haswell, l.c., p. 334, pl. xxi., f. 8; Cat. Crust., p. 257, no. 450. Clark Island, P.J.
115 M. crassipes, Haswell, l.c., Vol. v., p. 103, pl. vii., f. 2; Cat. Crust., p. 258, no. 452. P.J.
116 Megamœra Mastersii, Haswell, l.c., Vol. iv., p. 265, pl. xi., f. 1; Cat. Crust., p. 258, no. 453. P.J.
117 M. subcarinata, Haswell, l.c., p. 335, pl. xxi., f. 4; Cat. Crust., p. 260, no 455. P.J.
118 M. Bœckii, Haswell, l.c., p. 336, pl. xxi., f. 6; Cat. Crust., p. 21, f. 6. P.J.
119 Wyvillea longimanus, Haswell, l.c., p. 337, pl. xxii., f. 7; Cat. Crust., p. 261, no. 458. P.J.
120 Polycheria tenuipes, Haswell, l.c., p. 345, pl. xxii., f. 8; Cat. Crust., p. 262, no. 459. P.J.
121 P. brevicornis, Haswell, l.c., p. 346; Cat. Crust., p. 263, no. 460. P.J.
122 Microdeutopus Australis, Haswell, l.c., p. 271, pl. xi., f. 5; Cat. Crust., p. 263, no. 461. P.J.
123 M. Mortoni, Haswell, l.c., p. 339, pl. xxii., f. 4; Cat. Crust., p. 264, no. 462. P.J.
124 M. tenuipes, Haswell, l.c., p. 339, pl. xxii., f. 1; Cat. Crust., p. 264, no. 463. Clark Island, P.J.
125 M. chelieer, Haswell, l.c., p. 440, pl. xxii., f. 3; Cat. Crust. p. 265, no. 464. P.J.

Family CORYPHIIDÆ.

126 Amphithœ quadrimanus, Haswell, l.c., p. 337, pl. xxi., f. 7; Cat. Crust., p. 266, no. 465. Clark Island, P.J.
127 A. cinerea, Haswell, l.c., p. 269, pl. xi., f. 4; Cat. Crust. p. 267, no. 466. P.J.
128 A. grandimanus, Haswell, l.c., p. 270; Cat. Crust., p. 267, no. 467. P.J.
129 A. setosa, Haswell, l.c., p. 270; Cat. Crust., p. 268, no. 468. Rock-pools, Botany Bay.
130 Xenocheira fasciata, Haswell, l.c., p. 272, pl. xi., f. 6; Cat. Crust., p. 268, no. 469. P.J.

131 HAPLOCHEIRA TYPICA, Haswell, l.c., p. 273, pl. xi., f. 2 ; Cat. Crust., p. 269, no. 470. Under stones at low water-mark, P.J.

132 PODOCERUS AUSTRALIS, Haswell ; l.c., p. 348, pl. vxi., f. 8 ; Cat. Crust., p. 270, no. 471. P.J.

133 CYRTOPHIUM PARASITICUM, Haswell, l.c., p. 274, pl. xxii., f. 1 ; Cat. Crust., p. 271, no. 472. P.J.

134 C. DENTATUM, Haswell, l.c., p. 274, pl. xxii., f. 5 ; Cat. Crust., p. 272, no. 473. P.J.

135 C. MINUTUM, Haswell, l.c., p. 343, pl. xxii., f. 6 ; Cat. Crust., p. 273, no. 474. P.J.

136 C. HYSTRIX, Haswell, l.c., Vol. v., p. 104, pl. vii., f. 3 ; Cat. Crust., p. 273, no. 475. P.J.

137 COLOMASTIX BRAZIERI, Haswell, l.c., Vol. IV., p. 343, pl. xxii., f. 4 ; Cat. Crust.' p. 274, no. 476. 2-10 fms. PJ.

138 ICILIUS AUSTRALIS, Haswell, l.c., p. 274, pl. xii., f. 2 ; Cat. Crust., p. 275, pl. iv., no. 477. P.J.

Tribe LAEMIDIPODA.

Family CAPRELLIDÆ.

139 PROTO NOVÆ-HOLLANDIÆ, Haswell, l.c., Vol. IV., p. 275, pl. xii., f. 3 ; Cat. Crust., p. 310, no. 532. P.J.

140 PROTELLA AUSTRALIS, Haswell, l.c., Vol. IV., p. 276, pl. xii., f. 4 ; Cat. Crust., p. 311, no. 533. P.J.

141 P. ECHINATA, Haswell, l.c., Vol. IV., p. 346, pl. xxii., f. 2 ; Cat. Crust., p. 312, no. 535. P.J.

142 P. HASWELLIANA, Mayer, in Die Caprelliden ; Haswell, P.L.S., N.S.W.. Vol. IX., p. 998.

143 HIRCELLA CORNIGERA, Haswell, l.c., Vol. IV., p. 347, pl. xxiii. f. 5 ; Cat. Crust., p. 313, no. 536. Clark Island, P.J.

144 CAPRELLA ÆQUILIBRA, Say.; Haswell, l.c., Vol. IX., p. 999. Off Ball's Head, P.J.

145 C. INERMIS, Haswell, l.c., Vol. IV., p. 348, pl. xxiii., f. 3 ; Cat. Crust., 314, no. 537. P.J.

146 C. ATTENUATA, Dana, U.S. Expl. Exp., Crust., p. 817, pl. lv., f. 1 ; Haswell, l.c., Vol. IX., p. 1000. P.J.

147 C. TENUIS, Haswell, l.c., Vol. IV., p. 276, pl. xii., f. 5 ; Cat. Crust., p. 312, no. 534. P.J.

148 C. OBESA, Haswell, l.c., Vol. IV., p. 348, pl. xxiv., f. 1 ; Cat. Crust., p. 214, no. 538. On piles Circular Quay, P.J.

ADDENDA TO THE AMPHIPODA.

Family ?

149 PLATYISHNOPUS MIRABILIS, Stebbing, C.R., Vol. XXIX., 1889, p. 830, pl. lviii. 2 - 10 fms., P.J.

150 Ampelisca acinaceus, Stebbing, C.R., Vol. xxix., p. 1036, pl. ci., pl. cii. Station 163 B, off P.J., 35 fms.
151 Platophium inconspicuum, Stebbing, C.R., Vol. xxix., p. 1194, pl. cxxxi. P.J., 2-10 fms.
152 Ancholomera Blossevillii, M.-Ed.; Stebbing, C.R., Vol. xxix., p. 1433. Off P.J., surface.
153 Tetrathyrus Moncœuri, Stebbing, C.R., Vol. xxix., p. 1481, pl. 184. Station 164 A.

Sub-Order II. Isopoda.

Family IDOTEIDÆ.

154 Idotea stricta, Dana, U.S. Expl. Exp., Crust., Vol. ii., p. 704, pl. xliv., f. 7; Cat. Crust., p. 276. N.S.W.

Family ONISCIDÆ.

155 Philougria marina, Chilton, P.L.S., N.S.W., Vol. ix., p. 463, pl. xi., f. 1-6. In rock-pools, Coogee Bay, (Chilton).
156 Ligia Australiensis, Dana, U.S. Expl. Exp., Crust., Vol. ii., p. 740, pl. xlix., f. 3; Cat. Crust., p. 281. N.S.W.

Family CYMOTHOIDÆ.

157 Ceratothoa imbricata, Fabr.; Miers, Zool. "Alert," p. 300. P.J.
158 Condonophilus argus, Haswell, P.L.S,, N.S.W., Vol. v., p. 471, pl. xvi., f. 1; Cat. Crust., p. 283. P.J.
159 Ourozeuktes Oweni, M.-Ed., Crust., Vol. iii., p. 276, pl. xxxiii., f. 8; Cat. Crust., p. 283, no. 488. P.J.

Family ÆGIDÆ.

160 Æga cyclops, Haswell, l.c., Vol. v., p. 11; Cat. Crust., p. 285, no. 490. P.J.

Family SPHAEROMIDÆ.

161 Sphaeroma verrucauda, White; Dana, U.S. Expl. Exp., Crust. II., p. 779, pl. lii., f. 6; Cat. Crust., p. 288, no. 495. P.J.
162 S. anomola, Haswell, l.c., Vol. v., p. 473, pl. x.6, f. 4; Cat. Crust., p. 288, no. 496. P.J.
163 S. lævis, Haswell, l.c., p. 473, pl. xvi., f. 5; Cat. Crust., p. 288, no. 497. On the beach at Bondi.
164 S. aspera, Haswell, l.c., p. 472, pl. xvi., f. 3; Cat. Crust., p. 289, no. 498. P.J.
165 S. Quoyana, M.-Ed., Hist. Nat., Crust., Vol. iii., p. 206; Cat. Crust., p. 287. Sydney.

166 CYMODOCEA ACULEATA, Haswell, l.c., Vol. v., p. 474, pl. xvi., f. 6 ; Cat. Crust., p. 291, no. 502. P.J.
167 CILICŒA TENUICAUDATA, Haswell, l.c., Vol. v., p. 475, pl. xvii., f. 2 ; Cat. Crust., p. 295. P.J.
168 C. SPINULOSA, Haswell, l.c., Vol. vi., p. 184, pl. iii., f. 3 ; Cat. Crust., p. 297. P.J.
169 C. CRASSA, Haswell, l.c., Vol. vi., p. 186 ; Cat. Crust., p. 298. P.J.
170 C. LATREILLEI, Leach ; Miers, Zool. "Alert," p. 308 ; Cat. Crust., p. 290, no. 501. P.J.
171 HASWELLIA CARNEA, Haswell, l.c., Vol. v., p. 476, pl. xvii., f. 4 ; Cat. Crust., p. 302, no. 520. P.J.
172 CERATOCEPHALUS GRAYANUS, White ; Beddard, C.R., Vol. xvii., p. 148. Off P.J.
173 BREGMOCERELLA TRICORNIS, Haswell, l.c., Vol. ix., p. 1005, pl. liii., f. 1. Dredged at Port Jackson Heads.
174 AMPHOROIDEA AUSTRALIENSIS, Dana, U.S. Expl. Exp., Vol. ii., p. 785, pl. lii., f. 13. N.S.W.

Family ARCTURIDÆ.

175 ARCTURUS BREVICORNIS, Haswell, l.c., Vol. vi., p. 195, pl. iv., f. 5 ; Cat. Crust., 304. P.J.?

Family ANTHURIDÆ.

176 PARANTHURA AUSTRALIS, Haswell, l.c., p. 477, pl. xviii., f. 1 ; Cat. Crust., p. 304, no. 525. P.J.
177 P. CRASSICORNIS, Haswell, l.c., p. 478, pl. xviii., f. 5 ; Cat. Crust., p. 305, no. 525. P.J.
178 P. MIERSI, Haswell, l.c., Vol. ix., p. 1012, pl. liii., f. 2-5. P.J.
179 HALIOPHASMA PURPUREA, Haswell, l.c., p. 476, pl. xviii., f. 3; Cat. Crust., p. 305, no. 526. P.J.
180 H. MACULATA, Haswell, l.c., p. 477, pl. xviii., f. 2 ; Cat. Crust., p. 306, no. 527.
181 EISOTHISTOS VERMIFORMIS, Haswell, P.L.S., N.S.W., Vol. ix., p. 676, pls. xxxvi.-xxxvii. In the tubes of Vermilia, Watson's Bay, (Dr. Haswell.)

Family TANAIDÆ.

182 APSEUDES OBTUSIFRONS, Haswell, l.c., Vol. vi., p. 748, f. 1-8 ; Cat. Crust., addenda. Dredged in P.J.
183 TANAIS TENUICORNIS, Haswell, l.c., Vol. ix., p. 1006, pl. l., f. 1-8. P.J.
184 BATHYTANAIS BATHYBROTUS, Beddard. C.R., Vol. xvii., p. 133, pl. xvii., f. 9-14. 2 – 10 fms., P.J.
185 PARATANAIS LINEARIS, Haswell, l.c., p. 1008, pl. l., f. 9-16. P.J.

Family ANCEIDÆ.

186 Anceus ferox, Haswell, l.c., Vol. ix., p. 1005, pl. lii., f. 1-5. P.J., (T. Hewitt).

Family ASELLIDÆ.

187 Stenetrium armatum, Haswell, l.c., Vol. v., p. 478 and Vol. ix., p. 1009, pl. li., f. 1-12; Cat. Crust., p. 308. P.J.
188 S. inferme, Haswell, l.c., Vol. v., p. 479, pl. xix., f. 2; Cat. Crust., p. 309. P.J.

Family SEROLIDÆ.

189 Serolis Bromleyana, Willemoes Suhm, P.R. Soc., London, Vol. xxiv., p. 591, 1876; C.R., Vol. xi., p. 53, pl. iv. Station 164 C. Off P.J.
190 S. elongata, F. E. Beddard, C.R., Vol. xi., p. 71, Off P.J.
191 S. pallida, F. E. Beddard, C.R., Vol. xi., p. 74, pl. viii., f. 6-16. Station 163.

Order II. THORACOSTRACA.

Sub-Order I. Stomatopoda.

192 Lysiosquilla Brazieri, Miers, Ann. & Mag. N.H., Vol. v., Ser. 5, p. 11, pl. i., f. 3-6; Cat. Crust., p. 206, no. 382. P.J.
193 Squilla miles, Hess., Arch. f. Nat., xxxi., p. 169, pl. vii., f. 21; Cat. Crust., p. 207, no. 385. P.J.?
194 S. lævis,? Hess., Arch. fur Nat., xxxi., p. 170, pl. vii., f. 22. P.J.

Sub-Order II. Schizopoda.

Family EUPHAUSIIDÆ.

195 Euphausia gracilis, Dana, U.S. Expl. Exp., Crustacea, p. 644, pl. xlii., f. 6 a-c; C.R., Vol. xiii., p. 89, pl. xv., f. 12-13. Off P.J. ("Challenger.")
196 E. latifrons, G. O. Sars, C.R., Vol. xiii., p. 95, pl. xvi., f. 17-23. Off P.J. ("Challenger.")
197 Nyctiphanes Australis, G. O. Sars, C.R., Vol. xiii. p. 115, pl. xx.; pl. xxi., f. 1-7. Off P.J. ("Challenger.")
198 Thysanessa gregaria, G. O. Sars, C.R., Vol. xiii., p. 120, pl. xxi., f. 8-17; pl. xxii. Off P.J. ("Challenger.")

Family MYSIDÆ.

199 Siriella Thompsoni, M.-Ed.; Sars, C.R., Vol. xiii., p. 205, pl. xxxvi., f. 1-24. Between Sydney and Wellington.

I. MACROURA.

THALASSINIDEA.

Sub-Order Decapoda.

Family GEBIIDÆ.

200 GEBIA HIRTIFRONS, White ; Miers, Zool. "Erebus & Terror," Crust., p. 4, pl. iii., f. 5. P.J., in the interior of sponges.
201 G. SP. P.J.
202 AXIUS SP. Under stones, Watson's Bay (W).

Family THALASSINIDÆ.

203 THALASSINA MAXIMA, Hess., Archiv. fur Nat., XXXI., p. 163, pl. vii., f. 18, 1865. Sydney ? (Hess.)

Family CALLIANASSIDÆ.

204 TRYPAEA AUSTRALIENSIS, Dana, U.S. Expl. Exp., Vol. I., p. 613, pl. xxxii., f. 4a. Illawarra.

ASTACIDEA.

Family SCYLLARIDÆ.

205 IBACUS PERONII, Leach, Zool. Miscel., Vol. XI., pl. cxix. ; Cat. Crust., p. 168, no. 316. P.J.
206 I. CILIATUS, Von Siebold, De Haan Fauna Jap., Crust., p. 153, pl. xxxvi.-xxxvii., f. 2. There are two examples of this species in the Australian Museum labelled P.J.

Family PALINURIDÆ.

207 PALINURUS HUGELII, Heller, Reise der Novara, Crust., p. 46, pl. viii.; Cat. Crust., p. 173, no. 323. Taylor Bay, P.J. (W.)
208 P. LELANDII, M.-Edwards, Hist. Nat. Crust., Vol. II., p. 293. P.J. ?

CARIDEA.

Family CRANGONIDÆ.

209 RHYNCHOCINETES RUGULOSUS, Stimpson, P. Acad., N. Sci., Phil., Vol. XII., sp. 440 ; Cat. Crust., p. 180, no. 337. This is a very handsome species ocellated and streaked with deep blue, under stones Watson's Bay, P.J. (W.)
210 GNATHOPHYLLUM FASCIOLATUM, Stimp., Proc. Acad. N. Sci., Phil. Vol. XII., p. 28, Cat. Crust., 181, no. 339. P.J.
211 RHYNCHOCYCLUS COMPRESSUS, Stimp., l.c., XII., p. 28 ; Cat. Crust., p. 182, no. 340. P.J.

Family ALPHEIDÆ.

212 VIRBIUS AUSTRALIENSIS, Stimp., l.c., XII., sp. 436; Cat. Crust. p. 186, no. 347. P.J.

213 ALPHEUS MINOR var. NEPTUNUS, Dana; Miers, Zool. "Alert," p. 288. Between Ball's Head and Goat Island, (J. Brazier) P.J.

214 A. EDWARDSII, Audouin; see Miers in "Alert" Report, p. 284. Common under stones, P.J. (W.)

215 A. SP. P.J.

216 A. SP. P.J.

217 A. SP. P.J.

218 BETAEUS AUSTRALIS, Stimp., P. Acad. N. Sci., Vol. XII., p. 28; Cat. Crust., p. 192, no. 359. P.J.

219 B. TRISPINOSA, Stimp., l.c., p. 28; Cat. Crust., p. 192, no. 359. P.J

220 B. SP. Botany Bay, (W.) P.J.

221 ALOPE PAPALIS, White; Miers, Zool. "Erebus & Terror," Crust., p. 4, pl. iv., f. 1; Cat. Crust. p. 193, no. 361. Common at Watson's Bay, under stones and in rock-pools.

Family PALAEMONIDÆ.

222 LEANDER INTERMEDIUS, Stimp., l.c., sp. 464; Cat. Crust., p. 195, no. 364. P.J.

223 L. SERENUS, Heller, R. d. Novara, Crust., p. 110, pl. x., f. 5; Cat. Crust., p. 195, no. 365. P.J.

224 PALAEMON AFFINIS, M.-Ed.; Bate, C.R., Vol. XXIV., p. 782, f. 5. Off P.J.

Family PANDALIDÆ.

225 PANDALUS LEPTORHYNCHUS, Stimp., P. Acad. N. Sci., Phil., Vol. XII., sp. 447; Cat. Crust., 197, no. 369. P.J.

226 PLESIONIKA SEMILÆVIS, Bate, C.R., Vol. XXIV., p. 644, pl. cxiii., f. 3. Off P.J.

Family PENAEIDÆ.

227 PENAEUS CANALICULATUS, Oliver; Hess, Arch. fur Natur., XXXI., p. 168, pl. vii., f. 19; Cat. Crust., p. 119, no. 370. P.J.

228 P. MONODON, Fabr., = *P. semisulcatus*, De Haan, Fauna Jap. Crust., p. 191, pl. xlvi., f. 1, = *P esculentus*, Haswell, Cat. Crust., p. 200, no. 374. This is the "Tiger Prawn" of the Sydney fishermen. Spence Bate in the Challenger Report, Vol. XXIV., p. 250, says that the females alone have a groove on the dorsal carina; in Dr. Haswell's specimen from Port Darwin, there is a well marked groove, the specimen is a male. P.J.

229 P. MACLEAYI, Haswell, P.L.S., N.S.W., Vol. IV., p. 40 ; Cat. Crust., 201, no. 175. P.J.

230 P. SP. This is probably an undescribed form. The carapace is hairy, sculptured, and each of the first three pairs of legs bears a spine near the base. This is by far the commonest species offered for sale, *P. caniculatus* and *P. Macleayi* are often seen intermixed with it, the last named being the rarest of the two. *P. monodon* appears to be fairly abundant at certain seasons, but it is seldom seen in fish shops. P.J.

231 P. GRACILIS, Dana, U.S. Expl. Exp., p. 606, pl. iv., f. 7 a-b. Off P.J. ("Challenger.")

232 SERGESTES ARMATUS, Kroyer ; Bate, C.R., Vol. XXIV., p. 410, pl. lxxiii., f. 1. P.J

233 S. PARVIDENS, Bate, C.R., p. 409, pl. lxxiv., f. 3. Off P.J.

234 LUCIFER TYPUS, Thompson ; Bate, C.R., p. 464, pl. lxxxiii. P.J.

235 SICYONIA OCELLATA, ? Stimpson ; Cat. Crust., p. 205, no. 387. P.J.

II. BRACHYURA.

OXYRHYNCHA.

Family INACHIDÆ.

236 STENORHYNCHUS FISSIFRONS, Haswell, P.L.S., N.S.W., Vol. III., p. 409, Vol. IV., p. 432 ; Cat. Crust., p. 2. no. 2. P.J.

237 S. BREVIROSTRIS, Haswell, P.L.S., N.S.W., Vol. III., p. 408, Vol. IV., p. 432 ; Cat. Crust., p. 3, no. 3. P.J.

238 ACHAEUS LACERTOSUS, Stimpson, Proc. Acad. Nat. Science, Philadelphia, Vol. IX., p. 218, 1857 ; Cat. Crust., p. 3, no. 4. P.J.

239 A. AFFINIS, Miers, Zool. "Alert," p. 188. 5 – 7 fms., P.J.

240 A. TENUICOLLIS, Miers, C.R., Vol. XVII., p. pl. i., f. 2. Off P.J.

241 ONCINOPUS ARANEA, De Haan, Fauna Japonica, Crust., p. 100, pl. xxix., f. 2. P.J.

242 HALIMUS TUMIDUS, Dana, in Wilkes, U.S. Expl. Expedition Crust. I., p. 165 ; Cat. Crust., p. 6, no. 8. P.J.

243 H. SPINOSUS, Hess, Arch. für Natur., Bd. XXXI., 1865, p. 129, pl. vii., f. 1 ; Cat. Crust., p. 6, no. 9. P.J.

244 MICROHALIMUS DEFLEXIFRONS, Haswell, P.L.S., N.S.W., Vol. IV., p. 435, pl. XXV., f. 2 ; Cat. Crust., p. 7. no. 11. P.J.

245 LISPOGNATHUS THOMSONI, Norman in Wyville Thomson's Depths of the Sea, p. 174, f. 34 ; C.R., Vol. XVII., p. 28, pl. v., f. 2. 410 fms. off P.J.

246 Huenia bifurcata, Streets, Proc. Acad. Nat. Sci., Phil., 1870, p. 107 ; Miers, Cat. Crust. N.Z., p. 3 ; Cat. Crust., p. 8, no. 14. P.J.

Family MAIIDÆ.

247 Gonatorhynchus tumidus, Haswell, P.L.S., N.S.W., Vol. iv., p. 439, pl. xxv., f. 4 ; Cat. Crust., p. 10, no. 17. P.J.
248 Paramithrax sternocostulalus, A. M.-Ed. ; Cat. Crust., p. 13, no. 22. P.J.
249 Micippoides longimanus, Haswell, P.L.S., N.S.W., Vol. iv., p. 444, pl. xxvi., f. 5 ; Cat. Crust., p. 19, no. 30. P.J.
250 Hyastenus diacanthus, De Haan, Fauna, Jap., Crust., p. 86, pl. xxiv., f. 1 ; Cat. Crust., p. 20. P.J.
251 Micippa parvirostris, Miers, Ann. & Mag. Nat. Hist., 5 Ser., Vol. iv., p. 13, pl. iv., f. 9 ; Cat. Crust., p. 23, no. 37. P.J.
252 M. spinosa, Stimp., P. Acad. N. S. Phil., p. 218, 1857 ; Cat. Crust., p. 26, no. 42. Sow and Pigs Reef, P.J.
253 Paramicippa spinosa, Stimpson ; Miers, Zool. "Alert," p. 199. P.J.
254 Cryptopodia spatulifrons, Miers, Ann. & Mag. N. H., 5 Ser., Vol. iv., p. 26, pl. v., f. 10 ; Cat. Crust., p. 37, no. 59. P.J.

Family PARTHENOPIDÆ.

255 Gonatonotus crassimanus, Haswell, P.L.S., N.S.W., Vol. iv., p. 455, pl. xxvi., f. 4 ; Cat. Crust., p. 39, no. 62. P.J.

Cyclometopa.

Family CANCRIDÆ.

256 Actaea granulata, Aud., Explication des Planches de l'Egypte, Crust., pl. vi., f. 2 ; Cat. Crust., p. 44, no. 70. Under stones Neutral Bay, P.J., (W.)
257 A. affinis, Dana, U.S. Expl. Exp., Crust. I., p. 197, pl. xi., f. 3 ; Cat. Crust., p. 45, no. 72. P.J.
258 A. Peronii, M.-Ed., Hist. Nat., Crust. I., p. 392 ; Hess, Arch. fur Nat., xxxi., p. 132, pl. vi., f. 3 ; Cat. Crust., p. 46, no. 73. P.J.
259 Xanthodes notatus, Dana, U.S. Expl. Exp., Crust. I., p. 178. pl. viii., f. 12 ; Cat. Crust., p. 49, no. 78 Under stones, Cabbage Tree Bay ; Watson's Bay, P.J. (W.)
260 X. atromanus, Haswell ; Cat. Crust., p. 49, no. 79. Under stones, Watson's Bay, (W.)
261 Cycloxanthus punctatus, Haswell, P.L.S., N.S.W., Vol. vi., p. 752 ; Cat. Crust., p. 50, no. 81. Coogee Bay, (W.) ; Parramatta River.

262 PSEUDOCARCINUS GIGAS, Lam., Cat. Crust., p. 52, no. 83. Lane Cove River, (Trebeck.)

263 CHLORODOPSIS AREOLATUS, M.-Ed., Nat. Hist., Crust. I., p. 400 ; Nouv. Archives du Museum, IX., p. 231, pl. viii., f. 8 ; Cat. Crust., 54, no. 88. P.J.

264 CHLORODIUS NIGER, Forskäl ; Miers, Zoology of H.M.S. "Samarang," Crust., p. 40, pl. x., f. 4, (as *C. hirtipes)*; Cat. Crust., p. 62, no. 103. P.J.

Family ERIPHIIDÆ.

265 OZIUS TRUNCATUS, M.-Ed., Nat. Hist., Crust. I., p. 406, pl. xvi., f. 11 ; Cat. Crust., p. 63, no. 104. P.J.

266 O. LOBATUS, Heller, Reise der Novara, Crust., p. 21, pl. ii., f. 4 ; Cat. Crust., p. 64, n. 105. P.J.

267 PILUMNUS RUFOPUNCTATUS, Stimp., P. Acad. N.S., Phil., Vol. x., sp. 90 ; Cat. Crust., p. 66, no. 112. Cabbage Tree Bay, (W.); P.J.

268 P. VESTITUS, Haswell, P.L.S., N.S.W., Vol. VI., p. 753 ; Cat. Crust., p. 68, no. 117. P.J.

269 P. FISSIFRONS, Stimpson, P. Acad. Nat. Sci., Phil., Vol. x., sp. 91 ; Cat. Crust.. p. 68, pl. i., f. 6. Cabbage Tree Bay, (W.); P.J.

270 P. GLABERRIMUS, Haswell, P.L.S., N.S.W., Vol. VI., p. 544 ; Cat. Crust., p. 69, no. 120. P.J.

271 P. INERMIS, Haswell, l.c., Vol. VI., p. 544 ; Cat. Crust., p. 70, no. 121. P.J.

272 P. LANATUS, Latreille ; Miers, Zool. "Alert," p. 220, pl. xxi., f. B. 5 – 7 fms., P.J.

273 P. INTEGER, Haswell, l.c., Vol. VI., p. 545 ; Cat. Crust., Addenda. P.J.

274 PILUMNOPEUS SERRATIFRONS, Kinahan, Jour. Roy. Dublin Soc., I., p. 113, pl. iv., f. 1, 1856 ; Cat. Crust., p. 70, pl. xi., f. 1, no. 122. Neutral Bay, P.J. (W.)

275 HEXAPUS SEXPES, Fabr., Entom. Syst. Suppl., p. 134 ; M.-Ed., in N. Arch. du Mus., IX., 253, pl. xii., f. 1 ; Cat. Crust., p. 71, no 123. P.J.

Family PORTUNIDÆ.

276 NEPTUNUS PELAGICUS, Linn., Syst. Nat., (ed XII.) p. 1042, 1766 ; Cat. Crust. p. 77, no. 131. P.J.

277 NEPTUNUS SANGUINOLENTA, Herbst., Krabben u. Krebse I., p. 161, pl. viii., figs. 56-57, (1796) ; Cat. Crust., p. 77, no. 132. P.J.

278 N. TOMENTOSA, Haswell, P.L.S., N.S.W., Vol. VI., p. 547 ; Cat. Crust., p. 78, no. 133. P.J.

279 Scylla serrata, Forskäl ; A. M.-Ed., Ann. Sci. Nat., xiv., 4 Ser., p. 252, pl. i., f. 11, 1860 ; Cat. Crust., p. 72, no. 134. Botany ; P.J.
280 Thalamita prymna, Herbst., Krab. u. K., pl. vii., f. 2 ; Fauna Japonica, Crust., p. 43, pl. xii., f. 2 ; Cat. Crust., p. 80, no. 137. P.J.
281 T. sima, M.-Ed. ; Miers, Zool. "Alert," p. 231. P.J.
282 T. admete, Herbs.; Miers, Zool. "Alert," p. 230. 5 fms., P.J.
283 Goniosoma crucifera, Fabr., Suppl., p. 364 ; Cat. Crust., p. 81, no. 138. P.J.
284 Nectocarcinus integrefrons, Latr., M.-Ed., Nouv. Archiv. du Museum, x., p. 406, pl. xxxviii., f. 1, a, b, c, d, e, f, 1860 ; Cat. Crust.. 81. no. 139. This species is often infested by a parasitic Crustacean *(Sacculina)*, see Note by Dr. Haswell, P.L.S., N.S.W., 1888. P.J.
285 Lissocarinus polybioides, Adams and White, Voyage of "Samarang," Crust., p. 46, pl. xi., f. 5 ; Cat. Crust., p. 83, no- 142. P.J.
286 Platyonychius bipustulatus, M.-Ed., H. N., Crust I., p. 437, pl. xvii., f. 7-10 ; Cat. Crust., p. 84, no. 145. P.J.
287 Eucrate sexdentatus, Haswell, Cat. Crust., p. 86 ; Zool. "Alert," pl. xxiv., f. B. Off Botany, 45 fms.

Catametopa.

Family MACROPHTHALMIDÆ.

288 Macrophthalmus carinimanus, M.-Ed., H.N., Crust. II., p. 65 ; Cat. Crust., p. 88, no. 150. P.J.
289 M. setosus, M.-Ed., H.N., Crust. II., p. 65 ; Cat. Crust., p. 89, no. 154. P.J.
290 M. punctulatus, Miers, Zool. " Alert," p. 237, pl. xxv., f. A. P.J.
291 Helœcius cordiformis, M.-Ed., H.N., Crust. II., p. 53 ; Cat. Crust., p. 91, no. 158. Common on mud flats Mossman's Bay, P.J., (W.)
292 Gelasimus signatus, Hess., Arch. fur Nat. Band xxxi., p. 146 ; Cat. Crust., p. 93, no. 164. P.J.
293 G. variatus, Hess., l.c., p. 146, pl. vi., f. 7 ; Cat. Crust., p. 94, no. 165. P.J.
294 Ocypoda Macleayana, Hess., l.c., p. 143, pl. vi., f. 8, 1865 ; Cat. Crust., p. 95, no. 167. Bondi Bay. *O. cordimana* and *O. ceratophthalma* are to be found at Newcastle, (W.)

Family GRAPSIDÆ.

295 Grapsus variegatus, Fabr.; Haswell, Cat. Crust., p. 97, no. 170. Bondi Beach, common all round the coast and in P.J.

296 G. INORNATUS, Hess., Arch. fur Nat., p. 148, pl. vi., f. 11 ; Cat. Crust., p. 98, no. 176. P.J.

297 NAUTILOGRAPSUS MINUTUS, Linn.; Haswell, Cat. Crust., p. 99, no. 78. Among seaweed on the beach, Neutral Bay, (W.)

298 HETEROGRAPSUS SEXDENTATUS, M.-Ed., H.N., Crust. II., p. 79 ; Cat. Crust., p. 100, no. 179. N.S.W.

299 PACHYGRAPSUS TRANSVERSA, Geddes, Proc. Amer. Assoc. Ad. Sci., Vol. III., p. 110, 1850. Common under stones, Manly; Coogee ; Bondi, (W.)

300 CYCLOGRAPSUS LAVAUXI, M.-Ed., Ann. Sci. Nat., 3 Ser., xx., p. 187 ; Cat. Crust., p. 103, no. 186. Common under stones, Mossman's Bay, P.J. (W.)

301 CHASMAGNATHUS LÆVIS, Dana, U.S. Expl. Exp., Crust. I., p. 367, pl. xxiii., f. 7 ; Cat. Crust., p. 106, no. 193. Common under stones, Lane Cove ; Mossman's Bay, P.J. (W.)

302 C. HASWELLIANUS. This species was described by Dr. Haswell as *C. convexus*, P.L.S., N.S.W., Vol. VI., p. 550. De Haan described one under the same name ; they are however distinct, and I therefore dedicate this species to the learned author of the Cat. of Crustacea, p. 196, no. 124. P.J.

303 HELICE LEACHII, Hess, Arch. fur Nat., Band XXXI.,p. 153, 1865 ; Cat. Crust., p. 107, no. 196. P.J.

304 H. CRASSA, Dana, U.S. Expl. Exp., Crust., p. 367, pl. xxiii., f. 8. Sow and Pigs, P.J., ("Challenger.")

305 SESARMA ROTUNDATA, Hess, l.c., p. 159, pl. vi., f. 9 ; Cat. Crust., p. 108, no. 197. P.J.

306 S. ATRORUBENS, Hess, l.c., p. 148, pl. vi., f. 12 ; Cat. Crust., p. 108, no. 198. P.J.

307 S. SIMILIS, Hess, l.c., p. 150; Cat. Crust., p. 108, no. 199. P.J.

308 S. SCHUTTEI, Hess, l.c., p. 150, pl. vi., f. 11 ; Cat. Crust., p. 109, no. 200. P.J.

309 S. ERYTHRODACTYLA, Hess, l.c., p. 151, pl. vi., f. 10 ; Cat. Crust., p. 109, no. 201. Lane Cove River, left bank above bridge, common ; and at Mossman's Bay, P.J. (W.)

310 S. BIDENS, De Haan, Fauna Japonica, p. 60, pl. xiv., f. 4, pl. xi., f. 4 ; Miers, Zool. "Alert," p. 249. 5 fms., P.J.

311 PLAGUSIA TUBERCULATUS, Lam., Hist. Anim. sans Vert., p. 247 ; Cat. Crust., p. 110, no. 202. P.J.

312 P. GLABRA, Dana, U.S. Expl. Exp., Crust. I., p. 371, pl. xxiii., f. 10 ; Cat. Crust., p. 111, no. 204. Coogee Bay (W.); Bondi (J. D. Ogilby).

313 P. CHABRUS, Linn., Syst. Nat., p. 1044, 1766 ; Cat. Crust., p. 111, no. 205. P.J.

314 LEIOLOPHUS PLANISSIMUS, Herbst., = *P. clavimana*, Desm., Consid. Crust., p. 127, pl. xiv., f. 2, 1825 ; Cat. Crust., p. 112. P.J.

Family PINNOTHERIDÆ.

315 Hymenosoma planatum, Fabr., Ent. Syst. II., p. 446,(1793); Cat. Crust., p. 114, no. 209. P.J.
316 H. varium, Dana, U.S. Expl. Exp., Crust. I., p. 387, pl. xxiv., f. 9 ; Cat. Crust., p. 115, no. 211. P.J.
317 H. ovatus, Stimpson, Proc. Acad. N. Sci., Phil., p. 109, 1858. P.J.
318 H. Krefftii, Hess, Arch. fur Nat., Band xxxi., p. 141, pl. vi., f. 5, 1865 ; Cat. Crust., p. 115, no. 212. P.J.

Family MYCTERIDÆ.

319 Mycteris longicarpus, Latr., Encyclop., pl. ccxcvii., f. 3 ; Cat. Cust., p. 116, no. 214. Common on mud-flats, P.J.
320 M. platycheles, M.-Ed., Ann. Sci. Nat., tome xviii., p. 154 ; Cat. Crust., p. 117, no. 215. Botany.

Oxystomata.

Family LEUCOSIIDÆ.

321 Leucosia splendida, Haswell, P.L.S., N.S.W., Vol. iv., p. 47, pl. v., f. 1 ; Cat. Crust., p. 119, no. 224. P.J.
322 L. polita, Hess, Arch. fur Nat., xxxi., p. 155, pl. iv., f. 4 ; Cat. Crust., p. 120, no. 227. P.J.
323 L. Australiensis, Miers, C.R., Vol. xvii., p. 323, pl. xxvii., f. 1. 3 fms., P.J.
324 Phlyxia crassipes. Bell, Trans. Linn. Soc., Vol. xxi., p. 304, pl. xxxiv., f. 2 ; Cat. Crust., p. 124, no. 236.
325 P. granulosa, Haswell, P.L.S., N.S.W., Vol. iv., p. 54, pl. vi., f. 3 ; Cat. Crust., p. 126, no. 242. Dredged off P.J. Heads.
326 P. Ramsayi, Haswell, l.c., p. 55 ; Cat. Crust., p. 127, no. 243. P.J.
327 P. undecemspinosa, var. orbicularis, Haswell ; Miers, C.R., Vol. xvii., p. 309. Sow and Pigs Reef, P.J.
328 P. quadridentata, Gray, Zool. Miscell. II., 1841 ; Miers, Zool. "Alert," p. 252, P.J. ; var. spinifera, Miers, C.R., Vol. xvii., p. 309, pl. xxv., f. 3. P.J.
329 Matuta victrix, Fabr., Spec. Ins. II., append. p. 502, (1781); Cat. Crust., p. 133. P.J.
330 M. laevidactyla, Miers, Tran. Linn. Soc., Vol. i., Series 2, p. 247, pl. xl., f. 10-11. 3 fms. P.J.
331 M. lineifera, Miers, Trans. Linn. Soc., Vol. i., Series 2, Zoology, p. 243, pl. xxxix., f. 1-3, 1877 ; Cat. Crust., p. 134, no. 257. Chowder Bay.
332 M. picta, Hess, Arch. fur Nat., xxxi , p. 158, pl. vi,, f. 13 ; Cat. Crust., p. 135, no. 259. P.J.

333 CALAPPA HEPATICA, Linn., Cat. Crust., p. 136.
334 C. LOPHOS, Herbst., De Haan, Fauna Japonica, Crust., p. 72, pl. xxi., f. 1, (1837). Off P.J., ("Challenger.")
335 C. CRISTATA, Fabr.; M.-Ed., Hist. Nat., Crust., Vol. II., p. 105, pl. xx., f. 1. P.J.

DROMIDEA.

336 CRYPTODROMIA LATERALIS, Gray, Zool. Misc., p. 40, 1831; Cat. Crust., p. 139, no. 264. Under stones, Neutral Bay, (W.)
337 DROMIA AUSTRALIENSIS, Haswell, P.L.S., N.S.W., Vol. VI., p. 755; Cat. Crust., p. 139, no. 265. P.J.
338 D. EXCAVATA, Stimp., Proc. Acad. Nat. Sci., Phil., x., sp. 277; Cat. Crust., p. 140, no. 266. P.J.
339 D. SCULPTA, Haswell, P.L.S., N.S.W., Vol. VI., p. 756; Cat. Crust., p. 141, no. 268. Littoral, Green Point, P.J., (W.)

Family PARATOMOLIDÆ.

340 LATRAEILLA AUSTRALIENSIS, C.R., Vol. XXVII., p. 24, pl. ii., f. 4. Off P.J.
341 PARATYMOLUS LATIPES, Haswell, Ann. & Mag., Nat. Hist., Vol. v., Ser. 5, p. 303, pl. xvi., f. 1-2, 1880; Cat. Crust., p. 143, 271. P.J.

RANINIDEA.

342 RANINA DENTATA, Latr., Encyclop., Vol. x., p. 208; Cat. Crust., p. 144, no. 272. P.J.
343 LYREIDUS TRIDENTATUS, De Haan, Fauna Jap., Crust., p. 240, pl. v., f. 6, 1849; Cat. Crust., p. 144, no. 273. Off P.J. Heads.

PORCELLANIDEA.

344 PORCELLANA DISPAR, Stimp., P. Acad. Nat. Sci., Phil., Vol. x., sp. 297; Cat. Crust., p. 149, no. 283. Littoral, Neutral Bay, (W.)

PAGURIDEA.

345 EUPAGURUS SINUATUS, Stimp., P. Acad. N. Sci., Phil., Vol. x., p. 348; Cat. Crust., p. 153, no. 288. Under stones, in shells of *Turbo undulatum*, Watson's Bay, P.J., (W.)
346 E. ACANTHOLEPIS, Stimp., l.c., no. 350; Cat. Crust., p. 153, no. 289. P.J.
347 E. LACERTOSUS, var. NANA, Henderson, C.R., Vol. XXVII., p. 64, pl. vii., f. 1. Station 163 B, 35 fms. off P.J.

348 Pagurus pavimentatus, Hilgendorf, Monatsberichte der Berlin, Akad., 1878, p. 816, pl. iii., figs. 1-5. P.J. The Port Jackson specimens in the Australian Museum belong to this species, and so far *Eupagurus setifer* is wanting in the collection.

349 P. striatus, Latr.; De Haan, Fauna Japonica, Crust., p. 206, pl. xlix., f. 1. P.J.

350 P. pedunculatus, Herbst.; Miers, Ann. & Mag. N.H., Ser. 5, Vol. v., p. 374 ; Cat. Crust., p. 155, no. 293. P.J.

351 P. deformis, M.-Ed., Ann. des Sci. Nat., Ser. 5, Vol. vi., p. 272, pl. xiii., f. 4, 4a. In shell of Natica, P.J.

352 Anapagurus Australiensis, Henderson, C.R., Vol. xxvii., p. 74, pl. vii., f. 8. 2 – 10 fms., P.J.

353 Diogenes miles, Fabr. ; M.-Ed., l.c., p. 284, pl. xiv., f. 2 ; Cat. Crust., p. 156, no. 295. N.S.W., (Dana.)

354 D. custos, Fabr., Cat. Crust., p. 157, no. 296. P.J.

355 D. senex, Heller, Reise der Novara, Crust., p. 85, pl. vii., f. 3. In shells of *Lampania australis*, Watson's Bay, (W.)

356 Calcinus sp. Watson's Bay, (W.)

357 Clibanarius strigimanus, White, P.Z.S., 1847, p. 121, figured in the Zoology of the "Erebus" and "Terror," pl. ii., f. 4. In shell of *Voluta fusiformis*, off P.J.

358 C. sp. In shells of Lampania, Watson's Bay, (W.)

359 C. sp. In a shell of *Turritella Gunni*, off P.J. (Brazier.)

360 Paguristes barbatus, ? Heller, Reise der Novara, Crust., p. 90, pl. vii., f. 5. In the shells of *Turbo undulatum*, Watson's Bay, (W.)

361 P. sp. P.J.

362 Cancellus typus, M.-Edwards, Ann. des Sci. Nat., Ser. 2, Vol. vi.. p. 287, pl. xiv., f. 3, 3a ; Hist. Nat. Crust., Vol. ii., p. 243, = *Grallograpsus lithodomus*, Zietz., T. R. Soc., Adelaide, 1887, Vol. x., p. 298, pl. xiv. Dredged in P.J., (Dr. Ramsay.)

Galatheidea.

363 Galathea Australiensis, Stimpson, P. Acad. Nat. Sci., Phil., Vol. x., p. 351 ; Cat. Crust , p. 161, pl., no. 304. P.J.

364 Uryptychus australis, Henderson, C.R., Vol. xxvii., p. 179, pl. xxi., f. 4 410 fms., Station 163 B, off P.J.

365 U. gracillimus, Henderson, C.R., p. 181, pl. xxi., f. 5. 410 fms., Station 163 B, off P.J.

366 Munida Haswelli, Henderson, C.R., Vol. xxvii., p. 139, pl. iii., f. 5-5b. Off P.J., ("Challenger.")

Class II. ARACHNIDA.

Pycnogonidia.

Family NYMPHONIDÆ.

367 Nymphon æquidigitatum, Haswell, P.L.S., N.S.W., Vol. ix., p. 1022, pl. liv., f. 1-5. Dredged, P.J., (Dr. Haswell).

Family COLOSSENDEIDÆ.

368 Ammothea longicollis, Haswell, l.c., p. 1028, pl. lvi., f. 1-4. P.J., (Dr. Haswell).

369 A. assimilis, Haswell, l.c., p. 1026, pl. lv., f. 5-9. Clark Island, P.J., (Dr. Haswell).

370 Achelia lævis, var. Australiensis, Miers, Zool. "Alert," p. 323, pl. xxxv., f. A. P.J.

Family PALLENIDÆ.

371 Pallene chiragra, M.-Ed., Hist. Nat. Crust., Vol. iii., p. 535. P.J. ; Jervis Bay.

372 Phoxichilidium tubiferum, Haswell, l.c., p. 1032, pl. lvii., f. 1-5. Dredged, P.J., (Dr. Haswell).

Order ARANEIDA.

373 There is a very common species of Spider found under stones about low water mark, it appears to be covered with a short silky pubescence which prevents the salt water from wetting the body. Watson's Bay ; Taylor Bay, (W.)

Class HEXOPODA

Order NEUROPTERA.

Sub-Order Trichoptera.

374 Philanisus sp. R. MacLachlan, Entom. Month. Magazine, 1887, p. 154. In rock-pools between tide marks, near Mrs. Macquarie's Chair, (Dr. Haswell) ; Chowder Bay, (A. S. Olliff.)

Order HEMIPTERA.

375 Halobates Wulerstorffi, Buchanan White, Chall. Report, Vol. vii., p. 40, pl. i., f. 1. Surface, between Broken Bay and Port Jackson, (A. S. Olliff.)

Order DIPTERA.

Family CHIRONOMIDÆ.

376 Camptocladius crassipennis, Skuse, P.L.S., N.S.W., 1889. Among seaweed, P.J., (F. A. A. Skuse.)

Family TIPULIDÆ.

377 Dicronomyia marina, Skuse, P.L.S., N.S.W., 1889. Among seaweed, Manly, (F. A. A. Skuse.)

Sub-Kingdom MOLLUSCA.

Class PELECYPODA.

Order SIPHONIDA.

Sub-Order Sinupalliata.

Family GASTROCHAENIDÆ.

1 Aspergillum Strangei, A. Adams, P.Z.S., 1852, p. 91, pl. xv., f. 5. Near P.J. Heads.

2 Clavagella Australis, Sowerby ; Reeve, Conch. Icon., Vol. xviii., pl. iii. ; Sow., in Stutchbury's Catalogue, pl. i., f. 1. Watson's Bay, (Strange) (Angas).

Family PHOLADIDÆ.

3 Barnea similis, Gray, MS. Brit. Mus. ; Sow., Thes. Conch., pl. ciii., f. 12-14. Bottle and Glass Rocks, (Brazier).

Family SOLENIDÆ.

4 Solen Sloanii, Gray, MS. Brit. Mus.; Hanley, Cat. of Bivalve Shells, p. 12 and p. 336, pl. xi., f. 18 ; Sow., Conch. Icon., Vol. xix., pl. iii., f. 10. Middle Harbour.

5 Cultellus Australis, Dunker, P.Z.S., 1861, p. 443. Dredged in Lane Cove River.

Family SAXICAVIDÆ.

6 Saxicava Arctica, Linn. ; Reeve, Conch. Icon., Vol. xx., pl. i., f. 1, = *S. Australis*, Lam. ; Reeve, l.c., pl. ii., fig. 8 a, b, c, d. P.J.

7 S. Angasi, A. Adams ; Reeve, Conch. Icon., Vol. xx., pl. ii., sp. 11. Off Ball's Head, 18 fms., (Brazier.)

Family CORBULIDÆ.

8 Corbula tunicata, Hinds, P.Z.S., 1843, p. 55 ; Reeve, Conch. Icon.., Vol. ii., f. 5. Dredged in 5 to 7 fathoms, Lane Cove River.

9 C. nasuta, Sowerby, P.Z.S., 1833; Reeve, Conch. Icon., Vol. ii., pl. i., f. 1. Dredged in 7 to 10 fathoms, Inner North Head, P.J.

10 C. scaphoides, Hinds, P.Z.S., 1843, p. 56 ; Reeve, Conch. Icon., Vol. ii., pl. iii., f. 24. Dredged.

11 C. ZELANDICA, Quoy. & Gaim., Astrolabe, Vol. III., p. 511, pl. lxxxv., f. 12-14. Dredged in Middle Harbour.

12 C. SMITHIANA, Brazier, P.L.S., N.S.W., Vol. IV., p. 388, = *C. venusta*, Angas, (non Gould) P.Z.S., 1871, p. 20, pl. i., f. 29. Sow and Pigs Reef, 3 – 4 fms.; Mouth of Lane Cove River, 4 fms., (Brazier.)

13 NEAERA ANGASI, Smith, C.R., Vol. XIII., p. 47, pl. ix., f. 2, 2b. Station 164 B, off P.J., 401 fms.

14 N. BRAZIER, Smith, C.R., p. 51, pl. ix., f. 3-3b, = *N. rugata*, Angas (non A. Adams.) Sow and Pigs Reef.

15 N. PURA, Angas, P.Z.S., 1871, p. 20, pl. i., f. 30. Lane Cove River (Brazier.)

16 CRYPTOMYA ELLIPTICA, A. Adams, P.Z.S., p. 88, 1850. Lane Cove River in sandy mud, 3 fms., (Brazier.)

Family ANATINIDÆ.

(PANDORÆ.)

17 MYODORA CRASSA, Stutchbury, Zool. Jour., Vol. v., p. 100, Suppl. 43, f. 5-6; Reeve, Conch. Icon., Vol. II., pl. i., f. 1. Dredged in Middle Harbour.

18 M. PANDORÆFORMIS, Stutchbury, l.c., p. 43, f. 3, 4; Reeve, Conch. Icon., Vol. II., pl. i., f. 10. Dredged in Middle Harbour.

19 M. OVATA, Reeve, Conch. Icon., Vol. II., pl. i., f. 4. Dredged in P.J.

20 M. BREVIS, Stutchbury, l.c., 43, f. 1-2; Reeve, Conch. Icon., Vol. II., pl. i., f. 7 a-b. Dredged in Lane Cove River; Farm Cove, and Mossman's Bay.

21 MYOCHAMA ANOMIOIDES, Stutchbury, l.c., pl. xlii., f. 1-4; Woodward, Man. Moll., pl. xxiii., f. 13. Dredged near Sow and Pigs Reef.

22 M. STRANGEI, A. Adams, P.Z.S., 1852, pl. xv., f. 2. Dredged inside the North Head.

(THRACIÆ.)

23 THRACIA ANATINOIDES, Reeve, Conch. Icon., Vol. XII., pl. iii., f. 12. Dredged between Watson's Bay and Sow and Pigs Reef.

24 T. AUSTRALICA, Reeve, Conch. Icon., Vol. XII., pl. iii., f. 13. Dredged in P.J.

25 T. MODESTA, Angas, P.Z.S., p. 908, pl. xliv., f. 3, 18 1867; C.R., p. 71. Dredged off Ball's Head, (Brazier).

26 T. SPECIOSA, Angas, P.Z.S., 1869 p. 48, pl. ii., f. 12. Dredged off Sow and Pigs Reef, (Brazier).

27 T. ANGASIANA, Smith, Jour. Linn. Soc., Vol. XII., p. 560, pl. xxx., f. 23. Sow and Pigs Reef, (Brazier).

28 T. CULTRATA, Gould, Otia. Conch., p. 161. P.J.
29 T. BRAZIERI, Sowerby, P.Z.S., 1883, p. 465, = *T. Jacksoniensis*, Sowerby, P.Z.S., 1883, p. 30. Sow and Pigs Reef, (Brazier).
30 T. JACKSONIANA, Smith, Jour. Linn Soc., Vol. XII., p. 361, pl. XXX., f. 24. Sow and Pigs Reef, (Brazier.)
31 T. ANGUSTATA, Angas, P.Z.S., 1867, p. 908, pl. xliv., f. 1; C.R., p. 58. Dredged inside South Head Reef, (Brazier.)
32 T. ELEGANTULA, Angas, P.Z.S., 1867, p. 908, pl. xliv., f. 2. Dredged between Watson's Bay and Sow and Pigs Reef.

(ANATINÆ.)

33 ANATINA CRECCINA, Val., MS. Mus. Cuming.; Reeve, Conch. Icon., Vol. XIV., pl. ii., f. 12. P.J.
34 A. TASMANICA, Reeve, Conch. Icon., Vol. XIV., pl. iii., f. 20. P.J.
35 A. PROLONGATA, Reeve, Conch. Icon., Vol. XIV., pl. iv., f. 28. Dredged in sandy mud near Spectacle Island, P.J.
36 A. ANGASI, Crosse & Fischer, Jour. de Conch., 1864, Vol. XII., p. 394; 1865, p. 427, pl. xi., f. 1. Off Chowder Bay, 10 fms., (Brazier).

Family MACTRIDÆ.

37 MACTRA CONTRARIA, Deshayes, P.Z.S., 1854; Reeve, Conch. Icon., Vol. VIII., pl. xvii., f. 86. P.J.
38 M. PUSILLA, A. Adams, P.Z.S., 1855, p. 226; C.R., Vol. XIII., p. 60, pl. v., f. 8, 8e = *M. Luzonica*, Angas (non Deshayes) Dredged in Middle Harbour.
39 M. EXIMIA, Deshayes, P.Z.S., 1853; Reeve, Conch. Icon., Vol. VIII., pl. viii., f. 31. Dredged alive in Chowder Bay, (Brazier).
40 M. CRETACEA, Angas, P.Z.S., 1867, p. 909, pl. xliv., f. 6 = *M. producta*, Angas, P.Z.S., 1867, p. 909, pl. xliv., f. 7, = *M. fluviatilis*, Angas, P.Z.S., 1871, p. 20, pl. i., f. 31. Johnson's Bay and Parramatta River.
41 M. CORBULOIDES, Deshayes, P.Z.S., 1854; Reeve, Conch. Icon., Vol. VIII., pl. xix., f. 103. Rushcutter's Bay.
42 M. DEPRESSA, Reeve, Conch. Icon., Vol. VIII., f. 67; C.R., p. 57. P.J. 2 – 10 fms., ("Challenger.")
43 M. JACKSONIENSIS, Smith, C.R., Vol. XIII., p. 63, pl. v., f. 9, 9b, = *M. pusilla*, Angas, (non A. Adams). P.J., 2 – 10 fms., ("Challenger.")
44 M. OVALINA, Lam.; Reeve, Conch. Icon., Vol. XIV., f. 66. Dredged in Middle Harbour.
45 LUTRARIA DISSIMILIS, Deshayes, P.Z.S., 1854; Reeve, Conch. Icon., Vol. VIII., pl. ii., f. 8. In sandy mud, Middle Harbour.

46 L. ACINACES, Quoy & Gaim., Astrolabe, Vol. III., p. 545, pl. lxxxiii., f. 5, 6 ; Reeve, Conch. Icon., Vol. VIII., pl. iv., f. 14. Botany Bay.
47 EASTONIA ÆGYPTIACA, Gray ; Wood's, Index Test., pl. vi., f. 34. Lake Macquarie.

Family PAPHIIDÆ.

48 MESODESMA ELONGATA, Deshayes ; Reeve, Conch. Icon., Vol. VIII., Mesodesma, pl. i., f. 5. Botany Bay.
49 M. PRÆCISA, Deshayes, P.Z.S., 1854 ; Reeve, Conch. Icon., Vol. VIII., pl. iv., f. 31 ; = *obtusa*, Crosse & Fischer, Jour. de Conch., 1864, p. 350. Sand Spit, Middle Harbour.
50 ERVILIA BISCULPTA, Gould, P. Bost. Soc., N. Hist., 1861, Vol. VIII., p. 28 ; Otia. Conch., p. 166. P.J.

Family SEMELIDÆ.

51 SYNDOSMYA ELLIPTICA, Sowerby, Conch. Icon., Vol. XVII., f. 223 ; Zool. "Alert," p. 99, pl. vii., f. C, C 1, (as Tellina). P.J.
52 THEORA NITIDA, Gould, Otia. Conch., 162. Dredged, Lane Cove River, 6 fms. (Brazier).

Family TELLINIDÆ.

53 GARI TOGATA, Deshayes, P.Z.S., 1854, p. 318. (Psammobia). P.J.
54 G. MALACCANA, Reeve, Conch. Icon., Vol. x., (Psammobia) pl. vi., f. 42. Dredged, Lane Cove River.
55 G. ZONALIS, Lam.; Reeve, Conch. Icon., Vol. x., f. 29. Middle Harbour.
56 G. ANOMALA, Deshayes, P.Z.S., 1854, p. 320 ; Reeve, Conch. Icon., Vol. x., f. 5. Brisbane Water.
57 G. MODESTA, Deshayes, P.Z.S., 1854, p. 319 ; Reeve, Conch. Icon., Vol. x., f. 3 ; = *Menkeana*, Reeve = *angusta*, Reeve. P.J.
58 G. PALLIDA, Deshayes, P.Z.S., 1854, p. 323 ; Reeve, Conch. Icon., Vol. x., f. 42. P.J.
59 HIATULA EPIDERMIA, Deshayes ; Reeve, Conch. Icon., Vol. x., pl. i., f. 3. (Soletellina.) P.J.
60 H. BIRADIATA, Wood, Gen. Conch., pl. xxxiii., f. 1 ; Reeve, Conch. Icon., Vol. x., pl. ii., f. 7. Middle Harbour.
61 H. FLORIDA, Gould, P. Bost. Soc. N.H., 1846, Otia. Conch., p. 81. Curl Curl Lagoon.
62 TELLINA TRISTIS, Deshayes, P.Z.S., 1854 ; Sow., Thes. Conch. Vol. I., pl. lxiv., f. 229. Botany Bay.
63 T. ALBINELLA, Lam. ; Reeve, Conch. Icon., Vol. XVII., pl. xxi., f. 15 b. Broken Bay.

64 T. SUBELLIPTICA, Sowerby, Conch. Icon., Vol. XVII., pl. xxxix., f. 220 a-b. Dredged in Watson's Bay, 3 fms.
65 T. SEMITORTA, Sow., in Conch. Icon., Vol. XVII., pl. xxxix., f. 221 a-b ; C.R., p. 111. Dredged.
66 T. TICAONICA, Deshayes, P.Z.S., 1854, p. 358 ; Reeve, Conch. Icon., Vol. XVII., pl. li, f. 304. Dredged at Lane Cove.
67 T. TENUILIRATA, Sow., in Conch. Icon., Vol. XVII., pl. xxxix., f. 219 a-b ; C.R., p. 106. Dredged at Sow and Pigs Reef.
68 T. BRAZIERI, Sowerby ; Reeve, Conch. Icon., Vol. XVII., pl. lv., f. 323. Sow and Pigs' Reef, 5 fms., (Brazier).
69 T. UNIFASCIATA, Sow., in Conch. Icon., Vol. XVII., pl. xxix., f. 156. Dredged.
70 T. LILIUM, Hanley, P.Z.S., 1844 ; Thes. Conch., Vol. I., pl. lviii., f. 85. Dredged at Lane Cove.
71 T. SEMIPLANA, Sow., in Conch. Icon., Vol. XVII., pl. xxxix., f. 222 a-b. Dredged.
72 T. SEMIFOSSILIS, Sow., in Conch. Icon., Vol. XVII., pl. xli., f. 237. Johnson's Bay.
73 T. DECUSSATA, Lam.; Reeve, Conch. Icon., Vol. XVII., pl. xvii., f. 88. Bottle and Glass Rocks, (Brazier).
74 T. PERNA, Spengler , Reeve, Conch., Icon., Vol. XVII., pl. iv., f. 12 a, b. P.J.
75 T. STRIATULA, Lam.; Hanley, in Sow., Thes. Conch., Vol. I., p. 255, pl. lxi., f. 175. Outer North Head, 12 fms., (Brazier).
76 MYSELLA ANOMALA, Angas, P.Z.S., 1877, p. 176, pl. xxvi., f. 22. Off Shark Island, 12 fams., (Brazier).
77 DONAX DELTOIDES, Lam.; Reeve, Conch. Icon., Vol. VIII., pl. i., f. 4 a, b. = *epidemia*, Lam. Manly Beach.
78 D. RADIANS, Lam.; Reeve, Conch. Icon., Vol. VIII., pl. viii., f. 26 a. Berry's Bay, 5 fms.
79 D. NITIDUS, Deshayes, P.Z.S., 1854, p. 350 ; Reeve, Conch. Icon., Vol. VIII., f. 34 ; C.R., p. 112. Dredged in Middle Harbour, P.J.

Family PETRICOLIDÆ.

80 RUPELLARIA MITIS, Deshayes, P.Z.S., 1853, p. 5. Botany Bay.
81 R. CRENATA, Lam. ; Reeve, Conch. Icon., Vol. I., pl. i., f. 5. (as *Cypricardia serrata.*) P.J.
82 CHORISTODON RUBIGINOSUM, A. Adams & Angus, P.Z.S., 1863, p. 425, pl. xxxvii., f. 17. Dredged at Watson's Bay, 4 fms.

Family VENERIDÆ.

83 VENUS LAQUEATA, Sowerby, Thes. Conch., Vol. II., pl. cliii., f. 15 ; Reeve, Conch., Icon., pl. vi., f. 20. Dredged, Parramatta River and Lane Cove River,, 3 – 5 fms.

84 V. STRIATISSIMA, Sow., Thes. Conch., Vol. II., p. 718, pl. clvii., f. 103-105; Reeve, Conch. Icon., pl. xxvi., f. 135; C.R., p. 124. Dredged at Watson's Bay.

85 V. ROBORATA, Hanley, P.Z.S., 1844, p. 161; Reeve, Conch. Icon., Vol. XIV., pl. xxiii., f. 113. Dredged at Sow and Pigs Reef.

86 V. CALOPHYLLA, Philippi, Wiegmann's Arch. fur Nat., 1836, Bd. I., p. 229, pl. viii., f. 2; Reeve, Conch. Icon., Vol. XIV., pl. xxiii., f. 114; C.R., p. 122. Mouth of Lane Cove River.

87 V. LAMELLATA, Lam.; Reeve, Conch. Icon., Vol. XIV., pl. xviii., f. 78. Dredged at Sow and Pigs Reef, (Brazier.)

88 V. JACKSONI, Smith, C.R., Vol. XIII., p. 123, pl. iii., f. 2, 2c. P.J., 4 – 18 fms., ("Challenger.")

89 V. AUSTRALIS, Sow., P.Z.S., 1835, p. 22; Thes. Conch., Vol. II., p. 719, pl. clvii., f. 111-112. Watson's Bay.

90 V. FUMIGATA, Sow., Thes. Conch., Vol. II., p. 102, pl. clix., f. 152-155. Rose Bay, sandy flats.

91 V. LAEVIGATA, Sow., Thes. Conch., Vol. II., p. 103, pl. clix., f. 156-158. Berry's Bay, on sand flats at low water.

92 V. UNDULOSA, Lam., var.; Reeve, Conch. Icon., Vol. XIV., pl. xxv., f. 126 a-b. Dredged at Watson's Bay.

93 V. CHEMNITZI, Hanley, P.Z.S., 1844, p. 160; Reeve, Conch. Icon., Vol. XIV., pl. x., f. 32 a-b. Near the Heads and off Green Point, (Brazier).

94 V. (CHIONE) PAUCILAMELLATA, Dunker, Novitates Conchologicæ, p. 52, pl. xvi., f. 10, 11, 12, 1858, = *V. alatus*, Reeve, Conch. Icon., Vol. XIV., pl. xviii., f. 83, = *C. alatus*, Angas, P.Z.S., 1867, = *Callista Victoriæ*, Tenison-Woods, P.R.S., Tasmania, 1876, p. 171. P.J., (Brazier).

95 V. (CHIONE) SCABRA, Hanley, P.Z.S., 1844, p. 161; Reeve, Conch. Icon., Vol. XIV.; pl. xxi., f. 97. Sow and Pigs Reef, (Brazier).

96 CYTHEREA DISRUPTA, Sowerby, Thes. Conch., Vol. II., p. 743, pl. clxiii., f. 208-209; C.R., p. 135, pl. i.. f. 4, 4 E. Dredged at Watson's Bay.

97 C. RUTILA, Sow., Thes. Conch., Vol. II., p. 743, pl. clxiii., f. 205; C.R., p. 133. Watson's Bay.

98 C. HEBRAEA, Lam.; Reeve, Conch. Icon., Vol. XIV., f. 34; C.R., p. 138, = *C. Sophiæ*, Angas. Cape Solander, Botany Bay.

99 C. SCRIPTA, Linn.; Sow., Thes. Conch., (Circe) Vol. II., pl. 139, f. 38- 42; C.R., p. 141, = *undatina*, Lam.. P.J., 4 to 18 fms., ("Challenger.")

100 C. ANGASIA, Smith, C.R., Vol. XIII., p. 148, pl. ii., f. 4, 4e = *Gouldia Australis*, Angas. P.J.

101 Sunetta adelinae, Angas, P.Z.S., 1867, p. 909, pl. xliv., f. 5. Dredged in deep water near P.J. Heads.
102 Dosinia sculpta, Hanley; Reeve, Conch. Icon., Vol. vi., (Artemis) pl. ix., f. 52. Dredged.
103 D. scabriuscula, Philippi, Abbild. und Besch., Conch. 11, p. 230; Reeve, Conch. Icon., Vol. vi., pl. iii., f. 14. P.J.
104 D. puella, Angas, P.Z.S., 1867, p. 990, pl. xliv., f. 4. Botany Bay.
105 D. circinaria, Deshayes, Cat. Con. Brit. Mus., p. 9; C.R., p. 150, pl. i., f. 2, 2c. P.J., 2 – 10 fms., ("Challenger.")
106 Clementia papyracea, Gray, Ann. of Philosophy, Vol. ix., p 137, 1825; Woods, Index Test. Suppl. p. 5, pl. ii., f. 8; Chenu, Man. Con., Vol. ii., f. 410. Dredged at Mossman's Bay.
107 Tapes inflata, Deshayes, P.Z.S., 1853, p. 8, pl. xix., f. 3, = *T. turgidula*, Reeve, (non Desh.) Conch. Icon., Vol. xiv., pl. vii., f. 32. Dredged at Lane Cove River.
108 T. undulata, Born., Test. Mus. Caesar. Vindobon. p. 67; Reeve, Conch. Icon., Vol. xiv., f. 8; C.R., p. 115. Parramatta River.
109 T. turgida, Lam., Anim sans Vert., Vol. vi.. p. 358; Reeve Conch. Icon., Vol, xiv., pl. iii., f. 11. In mud at low water, Middle Harbour; Rose Bay.
110 T. semirugata, Phil.; Sow., Thes. Conch., Vol. ii., p. 681, pl. cxlv., f. 12, = *T. polita*, Sowerby. Dredged near Sydney, 6 fms.
111 T. fabagella, Deshayes, P.Z.S., 1853, p. 10; Reeve, Conch., Icon., Vol. xiv., f. 66. P.J.

Family GLAUCOMYIDÆ.

112 Glaucomya angulata, Reeve, P.Z S., 1844; Conch. Icon., Vol. ii., pl. i., f. 5. From sandy mud at low water, Lane Cove and Parramatta Rivers.

Sub-Order Integripalliata.

Family CARDIIDÆ.

113 Cardium papyraceum, Chemnitz, Conch. Cab., Vol. vi., p. 190, pl. xviii., f. 184; Reeve, Conch. Icon., Vol. ii., pl. ii., f. 9. Dredged in Middle Harbour.
114 C. tenuicostatum, Lam.; Reeve, Conch. Icon., Vol. ii., pl. x., f. 50; C.R., p. 159. Dredged, Botany Bay.
115 C. pulchellum, Gray, Diffenbach's New Zealand, Vol. ii., p. 252; Reeve, Conch. Icon., Vol. ii., pl. viii., f. 42. Dredged inside P.J. Heads.

116 C. DONACIFORME, Schroeter, Einl. Conch., Vol. III., p. 68, pl. vii., f. 14, 1786 ; Reeve, Conch. Icon., Vol. II., pl. v., f. 25, = *C. Australiense*, Reeve, Conch. Icon., Vol. II., pl. v., f. 24.

Family CHAMIDÆ.

117 CHAMA SPINOSA, Brod., Trans. Z. Soc., Vol. I., p. 306, pl. XXXVIII., f. 8-9 ; Reeve, Conch. Icon., Vol. IV., pl. viii., f. 44. P.J.

118 C. REFLEXA, Reeve, Conch. Icon., Vol. IV., pl. iv., f. 16. Middle Harbour, (Rev. R. L. King).

119 CHAMOSTREA ALBIDA, Lam., = *Cleidothaerus chamoides*. Stutchbury, Zool. Jour. p. 98, pl. xlii., f. 5-8 ; Sow., Genera of Shells, f. 1-3. Near P.J. Heads.

Family LUCINIDÆ.

120 LUCINA SIMPLEX, Reeve, Conch. Icon., Vol. VI., pl. iii., f. 11. Botany Bay.

121 L. RUGIFERA, Reeve, Conch. Icon., Vol. VI., pl. i., f. 1. Found at low water amongst the rocks, Watson's Bay ; Middle Harbour.

122 L. PARVULA, Gould, Gtia. Conch., p. 174. Dredged, P.J. ; Botany Bay.

123 L. FIBULA, Reeve, Conch. Icon., Vol. VI., pl. vii., f. 33, 37, 38 a, b. P.J. (Brazier).

124 L. QUADRISULCATA, d'Orb., = *L. Cumingi*, A. Adams & Angas, P.Z.S., 1863, pl. xxxvii., f. 20. Dredged outside the Heads in 20 fms., (Brazier.)

125 L. ORNATA, Reeve, Conch. Icon., Vol. VI., pl. viii., f. 48. P.J.

126 L. QUADRATA, Angas, P.Z.S., 1877, p. 176. pl. xxvi., f. 24. Shark Island.

127 L. TUMIDA, Reeve, Conch. Icon., Vol. VI., pl. v., f. 22. Dredged.

128 L. GLOBOSUM, Forskal ; = *L. ovum*, Reeve, Conch. Icon., Vol. VI., pl. v., f. 21. Dredged in Botany Bay.

129 L. ICTERICA, Reeve, Conch. Icon., Vol. VI., pl. x., f. 60 a, b. Botany Bay.

130 L. ASSIMILIS, Angas, P.Z.S., 1867, p. 910, p. xliv., f. 8. N.S.W.

131 L. RAMSAYI, Smith, C.R., Vol. XIII., p. 174, pl. xiii., f. 2, 2b. P.J., 6 – 7 fms., ("Challenger.")

132 L. JACKSONIENSIS, Smith, C.R., Vol. XIII., p. 185, pl. xiii., 11, 11b. P.J., 6 – 5 fms., ("Challenger.")

Family UNGULINIDÆ.

133 MYSIA SPHAERICULA, Deshayes, (Diplodonta); Angas, P.Z.S., 1867, p. 927. Dredged in the Parramatta River and mouth of Lane Cove River.

134 M. GLOBULOSA, A. Adams, P.Z.S., 1855, p. 226. Dredged, P.J.
135 M. ADAMSI, Angas, P.Z.S., 1867, p. 910, pl. xliv., f. 9. Dredged, P.J.
136 M. JACKSONIENSIS, Angas, P Z.S., 1867, p. 910, pl. xliv., f. 10. Dredged in Middle Harbour.

Family ERYCINIDÆ.

137 MONTACUTA ANGASI, Smith, C.R., Vol. XIII., p. 204, pl. xii., f. 2, 2 b. P.J., 2 – 10 fms., ("Challenger.")
138 LASAEA SCALARIS, Philippi, Zeits. fur Malak., 1847, p. 72, sp. 4. In crevices of rocks at low water.
139 L. RUBRA, Mont.; Forbes & Hanley, Brit. Mollusca, Vol. II., p. 94, pl. xxxvi., f. 5, 6, 7 ; = *L. Australis*, Souverbie, Jour. de Conch., 1863, p. 287, pl. xii., f. 8. P.J.
140 KELLIA ROTUNDA, Deshayes, P.Z.S., 1855, p. 181 ; C.R., Vol. XIII., p. 202, pl. xi., f. 5, 5b. P.J.
141 K. SOLIDA, Angas, P.Z.S., 1877, p. 176, pl. xxvi., f. 25. Bottle and Glass Rocks, Vaucluse, (Brazier).
142 K. CYCLADIFORMIS, Deshayes, Trait. Elém., pl. xi., f. 6-9. P.J.
143 K. JACKSONIENSIS, Smith, Zool. "Alert," p. 105, pl. vii., f. F, F 1. P.J.
144 K. BALAUSTRINA, Gould, Otia. Conch., p. 172. P.J.
145 LEPTON ADAMSI, Angas, P.Z.S., 1867, p. 910, pl. xliv., f. 11. P.J.
146 L. CONCENTRICUM, Gould, Otia. Conch., p. 171. P.J.
147 SCINTILLA STRANGEI, Deshayes, P.Z.S., 1855, p. 181. Under stones, at low water.
148 S. ANOMALA, Deshayes, P.Z.S., 1855, p. 181. P.J.

Family CRASSATELLIDÆ.

149 CRASSATELLA FULVIDA, Angas, P.Z.S., 1871, p. 20, pl. i., f. 32. Dredged near Sow and Pigs Reef, (Brazier).

Family ASTARTIDÆ.

150 CARDITA AMABILIS, Deshayes, P.Z.S., 1852, p. 102, pl. XVII., f. 8, 9. Dredged.
151 C. EXCAVATA, Deshayes, P.Z.S., 1852, p. 100, pl. xvii., f. 1-3. P.J., 2 – 10 fms., ("Challenger.")
152 CARDITELLA ANGASI, Smith, C.R., Vol. XIII., p. 217, pl. XV., f. 9 9a. Station 163 B, off P.J., 35 fms., ("Challenger.")

Order ASIPONIDA.

Sub-Order Homomyaria.

Family TRIGONIDÆ.

153 TRIGONIA LAMARCKII, Gray, Ann. Mag. Nat. Hist., 1838; Reeve, Conch. Icon., Vol. XII., pl. i., f. 1 a, b, c. Off Ball's Head; off Green Point; Sow and Pigs Reef.
154 T. STRANGEI, A. Adams, P.Z.S., 1852, p. 91; Reeve, Conch. Icon., Vol. XII., pl. i., f. 4. Long Bay; off Green Point.

Family NUCULIDÆ.

155 NUCULA STRANGEI, A. Adams, in Thes. Conch., Vol. III., pl. ccxxix., f. 125. Dredged in Lane Cove River.
156 N. CONSOBRINA, A. Adams & Angas, P.Z.S., 1863, p. 427. Dredged in Parramatta River.
157 N. PUSILLA, Angas, P.Z.S., 1877, p. 177, pl. xxvi., f. 26. In shell sand, P.J., (Brazier.)
158 N. SIMPLEX, A. Adams, P.Z.S., 1856, p. 52. P.J., (Strange).
159 LEDA DOHRNI, Hanley, P..Z.S., 1861, p. 242. Dredged at Sow and Pigs Reef.
160 L. CRASSA, Hinds, P.Z.S., 1843, p. 99; Sow., Thes. Conch., Vol. III., pl. ccxxviii., f. 69. Dredged off P.J. Heads, 52 fms.
161 L. ENSICULA, Angas, P.Z.S., 1877, p. 177, pl. xxvi., f. 27. Off P.J. Heads, 45 fms., (Brazier.)
162 L. RAMSAYI, Smith, C.R., Vol. XIII., p. 241, pl. xx., f. 3, 3a. Station 164 A, 950 fms., ("Challenger.")

Family ARCIDÆ.

163 ARCA FASCIATA, Reeve, P.Z.S., 1844; Conch. Icon., Vol. II., pl. xv., f. 99. Under stones and in the crevices of rocks at low water.
164 A. PUSILLA, Sowerby, P.Z.S., 1833, p. 18. Common under stones, Watson's Bay and Middle Harbour.
165 A. TRAPEZIA, Deshayes, Mag. de Zoologie = *A. lobata*, Reeve, Conch. Icon., Vol. II., pl. iii., f. 3. In mud, very common in nearly all the bays in P.J.
166 A. GUBERNACULUM, Reeve, Conch. Icon., Vol. II., pl. iii., f. 14. Ball's Head, 18 fms.; P.J., 2 – 10 fms. ("Challenger.")
167 PECTUNCULUS HOLOSERICEA, Reeve, P.Z.S., 1843; Conch. Icon., Vol. I., pl. iv., f. 18; C.R., p. 251. Watson's Bay.
168 P. GRAYANA, Dunker, P.Z.S., 1856, p. 367. Outer North Head, P.J.
169 P. TENUICOSTATUS, Reeve, P.Z.S., 1843; Conch. Icon., Vol. I., pl. vi., f. 35. Dredged off Sow and Pigs Reef.
170 P. STRIATULARIS, Reeve, Conch. Icon., Vol. I., pl. vi., f. 27; C.R., p. 251. P.J., 6 - 7 fms.
171 LIMOPSIS BRAZIERI, Angas, P.Z.S., 1871, p. 21, pl. i., f. 34. Dredged at Sow and Pigs Reef, (Brazier).
172 L. CANCELLATUS, Reeve, Conch. Icon., Vol. I., pl. vii., f. 39. Outside P.J. Heads, 45 fms., (Brazier).

Sub-Order Heteromyaria.

Family MYTILIDÆ.

173 Mytilis hirsutus, Lam.; Reeve, Conch. Icon., Vol. x., pl. iii., f. 8; C.R., p. 273. P.J.
174 M. Dunkeri, Reeve, Conch. Icon., Vol. x., pl. v., f. 17. N.S.W.
175 Modiola Australis, Gray, Appendix to King's Voy.; Reeve Conch. Icon., Vol. x., pl. v., f. 21.
176 M. glaberrima, Dunker, P.Z.S., 1856, p. 363; Reeve, Conch. Icon., Vol. x., pl. viii., f. 48. Parramatta River.
177 M. confusa, Angas, P.Z.S., 1871, p. 21, pl. i., f. 33. Lane Cove River.
178 Lithodomus splendida, Dunker, P.Z.S., 1856, p. 365; Reeve Conch. Icon., Vol. x., pl. v., f. 31. Off George's Head, P.J.
179 Modiolaria lanigera, Dunker, MS.; Reeve, Conch. Icon., Vol. x., pl. v., f. 30, = *L. barbatus*, Reeve.
180 M. Cumingiana, Dunker; Reeve, Conch. Icon., Vol. x., pl. ix., f. 63 a-b. Lake Macquarie, (Brazier).
181 M. varicosa, Gould, Otia., Conch., p. 176; Zool. "Alert," p. 109, pl. vii., f. m, m P.J., very common, (Brazier).
182 M. cuneata, Gould, Otia. Conch., p. 176. Sow and Pigs Reef; off Green Point; Cook's Landing-place Botany, (Brazier).
183 Modiolarca subtorta, Dunker; Reeve, Conch. Icon., Vol. x., pl. x., f. 70. Cook's River, Botany Bay.
184 Septifer bilocularis, Dunker; Reeve, Conch. Icno., Vol. x., pl. ix., f. 40-42. Cape Banks, (Brazier).

Family AVICULIDÆ.

185 Avicula pulchella, Reeve, Conch. Icon., Vol. x., pl. viii., f. 22. Attached to seaweed in deep water, Middle Harbour; Botany Bay.
186 A. fimbriata, Reeve, Conch. Icon., Vol. x., pl. ix., f. 25. Found under stones, Middle Harbour; Watson's Bay.
187 Vulsella Tasmanica, Reeve, Conch. Icon., Vol. xi., pl. i., f. 3. Found in Sponges, P.J.
188 Malleus albus, Chemnitz; Reeve, Conch. Icon., Vol. xi., pl. i., f. 1. Broken Bay.
189 M. legumen, Reeve, Conch. Icon., Vol. xi., pl. i., f. 2. Shark Island; off Bottle and Glass Rocks, (Brazier.)

Family PINNIDÆ.

190 Pinna Menkei, Hanley; Reeve, Conch. Icon., Vol. xi., pl. xviii., f. 34. Rose Bay, (Brazier).

Sub-Order Monomyaria.

Family SPONDYLIDÆ.

191 SPONDYLUS TENELLUS, Reeve, Conch. Icon., Vol. IX , pl. xviii., f. 6-7. Off Green Point, 8 fms., (Brazier).

192 PLICATULA IMBRICATA, Menke ; Reeve, Conch. Icon., Vol. IX., pl. i., f. 4. Green Point, P.J.

Family LIMIDÆ.

193 LIMA ANGULATA, Sow., Thes. Conch., Vol. I., p. 86, pl. xxii., f. 39, 40. P.J.

194 L. MULTICOSTATA, Sow., Thes. Conch., Vol. I., p. 85, pl. xxii., f. 38. Under stones.

195 L. BULLATA, Born., Test. Mus., Caesar., Vindobon., p. 110, pl. vi., f. 8 ; Sow., Thes. Conch., Vol. I., p. 84, pl. xxii., f. 32-33 ; C.R., p. 292. Under stones, Watson's Bay.

196 L. ORIENTALIS, Adams & Reeve, Voy. of "Samarang," pl. xi., f. 33 a-b. Dredged near Watson's Bay.

Family PECTINIDÆ.

197 PECTEN TEGULA, Wood, Index Test. Suppl., p. 7, pl. ii.; Reeve, Conch. Icon., Vol. VIII., pl. xxx., f. 136. Common under stones, Mossman's Bay ; Watson's Bay.

198 P. FUMATUS, Reeve, Conch. Icon., Vol. VIII., pl. vii., f. 32 ; C.R., p. 307. Lane Cove River.

199 P. BALLOTI, Bernardi, Jour. de Conch., 1861, p. 46, pl. i., f. 1. Obtained in the trawl alive, Neutral Bay, 6 fms., (Brazier).

Family ANOMIIDÆ.

200 PLACUNANOMIA IONE, Gray , Reeve, Conch. Icon., Vol. XI., pl. ii., f. 6 a, b, c. Under stones, Watson's Bay ; Taylor Bay.

Family OSTREIDÆ.

201 OSTREA EDULIS, Linn.; = *O. Angasi*, Sowerby ; Reeve, Conch. Icon., Vol. XVIII., f. 28, sp. 27. Mud Oyster, P.J.

202 O. CUCULATA, Born., Mus. Ind., Caes., pl. vi., f. 11-12 ; Reeve Conch. Icon., Vol. XVIII., pl. xvi., f. 34 a, b, c. Rock Oyster, P.J.

203 O. SUBTRIGONA, Sow.; Reeve, Conch. Icon., Vol. XVIII., pl. xviii., f. 38 a-b. Drift Oyster, P.J.

204 O. VIRESCENS, Angas, P.Z.S., 1867, p. 911, p. xliv., f. 13 ; Reeve, Conch. Icon., Vol. XVIII., pl. xi., f. 23. Watson's Bay, P.J.

205 O. MYTILOIDES, Lam. ; Reeve, Conch. Icon., Vol. XVIII., pl. xviii.,? f. 3. P.J., (Brazier.)

Class GASTEROPODA.

Sub-Class PROSOBRANCHIATA.

Order PECTINIBRANCHIATA.

Family MURICIDÆ.

206 MUREX ACANTHOPTERUS, Lam. ; Anim. Sans. Vert., Vol. VII., p. 165 ; Reeve, Conch. Icon., Vol. III., pl. xvi., f. 64 ; Tryon Man. Conch., Vol. II., p. 85, p. xl., f. 512. In shell-sand, Middle Harbour ; Watson's Bay, (Brazier).

207 M. ANGASI, Crosse, Jour. de Conch., 1863, p. 86, pl. i., f. 2 ; Tryon, l.c., p. 88, pl. xl., f. 522. Under stones, Watson's Bay, (Brazier).

208 M. PALMIFERUS, Sowerby, P.Z.S., 1840, p. 142 ; Reeve, Conch. Icon., Vol. III., Murex, pl. iv., f. 20 ; Tryon, l.c., p. 90, pl. xiv., f. 146, 147 ; pl. xxiv., f. 215 ; pl. xxv., f. 218. Common under stones, Neutral Bay and many other places.

209 M. BRAZIERI, Angas, P Z.S., p. 171, pl. xxvi., f. 3, 1877 ; Tryon, l.c., p. 132, pl. xxx., f. 289. Dredged outside P.J. Heads, 25 fms., (Brazier); in shell-sand, Middle Harbour.

210 TYPIS CLERYI, Sowerby, Thes. Conch., Vol. III., pl. cclxxxiv., f. 14 ; Tryon, Man. Conch., Vol. II., p. 137, pl. xxx., f. 296. Off P.J. Heads, 45 fms., (Brazier(.

211 T. ARCUATUS, Hinds, P.Z.S., p. 19, 1843 ; Voy. of "Sulphur," p. 10, pl. iii., f. 1-2 ; Tryon, l.c., p. 136, pl. xxx., f. 293, 297. Sow and Pigs Reef, 3 fms. ; outer North Head, 5 fms., (Brazier).

212 TROPHON CARDUELIS, Watson, Chall. Report, Vol. XV., p. 167, pl. x., f. 7. Off P.J., Station 164 B, 410 fms.

Sub-Family PURPURINÆ.

213 PURPURA SUCCINCTA, Martyn, Univ. Conch., Vol. II., pl. xlv.; Tryon, Man. Conch., Vol. II., p. 170, pl. li. Very common, Watson's Bay.

214 P. STRIATA, Martyn, Univ. Coch., pl. vii. ; Ed. Chemn., pl. iii., f. 1. Bondi ; Coogee ; Watson's Bay.

215 P. TEXTILOSA, Lam., Anim. Sans Vert., 2nd edit., Vol. x., p. 77 ; Reeve, Conch., Icon., Vol. III., pl. xii., fig. 66, 1846.

216 P. NEGLECTA, Angas, P.Z.S., p. 110, pl. xiii., f. 3. P.J.

217 P. AMYGDALA, Kiener, Icon. Coq. Viv., pl. x., f. 26 ; Tryon, Man. Conch., Vol. II., p. 179, pl. lv., f. 174. Under stones at low water, Watson's Bay ; Taylor Bay.

218 RICINULA ADELAIDENSIS, Crosse, Jour. de Conch., 1865, p. 50, pl. xi., f. 1 ; Tryon, Man. Conch., Vol. II., p. 189, pl. lix., f. 273. Jervis Bay.

219 R. MARGINIALBA, Blainville, Nouv. Ann. du Mus., pl. x., f. 6 ; Kiener, Coquille, Viv., p. 24, pl. v.,, f. 11, 11a. Common on the rocks between tide marks.

220 RAPANA (LATIAXIS) MODOSA, Ad. & Angas, P.Z.S., 1853, p. 93 ; Sowerby, Thes. Conch., Vol. v., pl. ccccxxiv., f. 17. Watson's Bay.

Family TRITONIDÆ.

221 TRITON AUSTRALE, Lam., Anim. sans Vert., Vol. VII., p. 179; Reeve, Conch. Icon., Vol. II., pls. iv.-v., f. 12a, 12b.

222 T. FUSIFORME, Kiener, Iconog., Coq. Viv., p. 36, pl. 5 f. 2 ; Tryon, Man. Conch., Vol. III., p. 11, pl. iv., f. 22. P.J.

223 T. COSTATUS, Born.; Tryon, Man. Conch., Vol. III., p. 11, pl. iii., f. 19 ; pl. iv., f. 24 ; pl. v., f. 27-29 ; pl. vi., f. 37. Common in P.J., Watson's Bay.

224 T. SPENGLERI, Chemnitz ; Reeve, Conch. Icon., Vol. II., pl. xi., f. 36 ; Tryon, l.c., p. 16, pl. ix., f. 61.

225 T. BOLTENIANUM, A. Adams, P.Z.S., 1854, p. 311. Long Bay.

226 T. DOLIARIUS, Linn.; Tryon, l.c., p. 16, pl. ix., f. 60. Coast of N.S.W., (Angas).

227 T. LABIOSUS, Wood, Index Test. Suppl., pl. v., f. 18 ; Tryon, l.c., p. 17, pl. ix., f. 64-68. P.J., (Brazier).

228 T. GEMMATUS, Reeve, Conch. Icon., Vol. II., pl. xv., f. 60 ; Tryon, l.c., p. 13, pl. vii., f. 41-44.

229 T. BRAZIER, Angas, P.Z.S., 1869, p. 46, pl. ii., f. 3. Cape Solander, Botany Bay, (Brazier).

230 T. SPECIOSA, Angas, P.Z.S., 1871, p. 13, pl. i., f. 1 ; Tryon, l.c., p. 25, pl. xiii., f. 120. In shell-sand, Middle Harbour; at low water Green Point, Watson's Bay, (Brazier).

231 T. EXARATUS, Reeve, Conch. Icon., Vol. II., pl. xiii., f. 50 a-b; Tryon, l.c., p. 22, pl. xii., f. 102, 104. P.J., (Brazier).

232 T. SUBDISTORTUS, Lam. ; Reeve, Conch. Icon., Vol. II., pl. i., f. 2 a-b. P.J.

233 RANELLA LEUCOSTOMA, Lam. ; Reeve, Conch. Icon., Vol. II., pl. i., f. 4 ; Tryon, Man. Conch., p. 42, pl. xxiii., f. 53, 54. Taylor Bay ; Farm Cove ; Watson's Bay.

234 R. VENUSTULA, Reeve, Conch. Icon., Vol. II., pl. vii., f. 37. Taken alive at Bottle and Glass Rocks, P.J., (T. Rossiter).

235 R. PUSILLA, Brod., P.Z.S., 1832, p. 194 ; Reeve, Conch. Icon., Vol. II., pl. viii., f. 44 a-b. Botany Heads.

Family FUSIDÆ.

236 FUSUS HANLEYI, Angas, P.Z.S., 1867, p. 110, pl. xiii., f. 1. Common under stones, Neutral Bay.

237 F. Paivæ, Crosse, Jour. de Conch., 1864, Vol. xii., p. 278, pl. xi., f. 7 ; Tryon, Man. Conch., Vol. ii., p. 155, pl. xxxix., f. 495. Under stones, P.J., (Angas).

238 F. pagodoides, Watson, C.R., Vol. xv., p. 197, pl. xiv., f. 3. Station 164 B, off Sydney, 410 fms.

239 F. Novæ-Hollandiæ, Reeve, Conch. Icon., Vol. iv., pl. xviii., f. 70. Cape Solander, Botany Bay, (Brazier).

240 Latirus Strangei, A. Adams, P.Z.S., 1854, p. 316. P.J. (Strange).

241 Cantharus Australis, Pease, Amer. Jour. Conch., Vol. vii., p. 2, 1872 ; Tryon, Man. Conch., Vol. iii., p. 160, pl. lxxiii., f. 269. Under stones, Watson's Bay.

242 C. unicolor, Angas, P.Z.S., p. 110, pl. xiii., f. 2, 1867 ; Tryon, Man. Conch., Vol. iii., p. 162, pl. lxxiv., f. 279. Under stones, Camp Cove, P.J., (Angas).

243 Cominella Adelaidensis, Crosse, Jour. de Conch., 1864, p. 276, pl. xi., f. 6. Middle Harbour, (Angas).

244 C. filicea, Crosse & Fischer, Jour. de Conch., 1864 p. 346, pl. iii., f. 15, 16 ; Tryon, Man. Conch., Vol. iii., p. 206, pl. lxxxi., f. 440. Bottle and Glass Rocks, (Brazier).

245 C. tritoniformis, Blainville, Nouv. Ann. du Mus., pl. x., f. 10 ; Tryon, Man. Conch., p. 156, pl. xxxix., f. 491, 488, 496. Common under stones, Watson's Bay and many other places.

246 Eburna Australis, Sowerby, Conch. Ill., f. 5 ; Tryon, Man. Conch, Vol. iii., p. 213, pl. lxxxii., f. 474 ; Reeve, Conch. Icon., Vol. v., pl. i., f. 4. Sow and Pigs Reef, (Brazier).

247 Nassaria curta, Gould, Otia. Conch., p. 125. P.J.

248 N. campyla, Watson, C.R., Vol. xv., p. 405, pl. xivi., f. 12. Station 164 B, off Sydney, 410 fms.

249 Cyllene lactea, Ad. & Angas, P.Z.S., 1863, p. 422. In shell-sand Hunter's Bay, Middle Harbour.

Family NASSIDÆ.

250 Truncaria Australis, Angas, P.Z.S., 1877, p. 172, pl. xxvi., f. 5 ; Tryon, Man. Conch., Vol. iv., p. 9, pl. v., f. 55. Dredged off Sow and Pigs Reef, P.J., (Brazier).

251 Nassa glans, var intermedia, Dunker, Voy. "Novara," Moll. p. 5, pl. ii., f. 1. Under stones, Watson's Bay, P.J.

252 N. Jacksoniana, Kiener, Mon. Bucc., pl. xix., f. 3. Common in shell-sand Middle Harbour, P.J.

253 N. pauperata, Lam., Anim. sans Vert., Vol. x., p. 183 ; Reeve, Conch. Icon., Vol. viii., pl. v., f. 27. Under stones, Watson's Bay, (Angas).

254 N. PAUPERA, Gould, Otia. Conch., p. 70 ; Tryon, Man. Conch. Vol. IV., p. 47, pl. XV., f. 246-250. In shell-sand Middle Harbour ; under stones, Watson's Bay.

255 N. MANGELOIDES, Reeve, Conch. Icon., Vol. VIII., pl. xxiii., f. 152 a-b ; Tryon, Man. Conch., Vol. IV., p. 26, pl. xxiii., f. 36. On mud flats at low water.

256 N. JONASI, Dunker, Phil. Abbild. Bucc., Vol. III., p. 66, pl. ii., f. 10 ; Tryon, Man. Conch., p. 26, pl. viii., f. 20-32. Middle Harbour.

257 N. REPOSTA, Gould, Otia. Conch., p. 127. P.J.

258 N CORONATA, Lam. ; Reeve, Conch. Icon., Vol. VIII., pl. iii., f. 20 a, b, c ; Tryon, Man. Conch., Vol. IV., p. 23, pl. vii., f. 7-8. Living specimen obtained on the beach Manly, (Brazier).

259 N. PERITREMA, Ten.-Woods, P.L.S., N.S.W., Vol. IV., p. 21, pl. iv., f. 2. Sow and Pigs Reef ; in shell-sand Middle Harbour.

260 NERITULA LUCIDA, Adams & Angas, P.Z.S., 1863, p. 35. In shell-sand, Coogee Bay.

Family VOLUTIDÆ.

261 VOLUTA FUSIFORMIS, Swainson ; Reeve, Conch. Icon., Vol. VI., pl. iii., f. 6. Got in the trawl, off P.J. Heads.

262 V. MAGNIFICA, Chemnitz, Conch. Cab. XI., pl. clxxiv.-clxxv.; Reeve, Conch. Icon. Vol. VI., pl. i., f. 2. North Harbour ; Sow and Pigs Reef ; off Garden Island, 10 fms., (Brazier).

263 V. UNDULATA, Lam.; Sowerby, Thes. Conch., Vol. I., p. 196, pl. xlviii., fig. 29. A worn specimen found at Hunter's Bay, Middle Harbour ; Dredged off Sydney Heads, 45 fms. (Brazier.)

264 MICROVOLUTA AUSTRALIS, Angas, P.Z.S., 1877, p. 35, pl. v., f. 2. Dredged in 25 fms. outside P.J. Heads, (Brazier).

Family MITRIDÆ.

265 MITRA MELANIANA, Lam. ; Tryon, Man. Conch., Vol. IV., p. 127, pl. xxxvii., f. 118-119. Under stones, Watson's Bay.

266 M. SOLIDA, Reeve, Conch. Icon., Vol. II., pl. iii., f. 18 ; Tryon, Man. Conch., Vol. IV., p. 20, pl. xxxv., f. 57. Dredged off Middle Head, (Angas).

267 M. STRANGEI, Angas, P.Z.S., 1867, p. 110 ; Tryon, M.C., Vol. IV., p. 136, pl. xxxix., f. 157. Dredged in Middle Harbour.

268 M. GLABRA, Swainson, Exotic. Conch., pl. xxiv. ; Reeve, Conch. Icon., Vol. II., pl. vi., f. 43 ; Tryon, M. Conch., Vol. IV., p. 117, pl. xxxiv., f. 42. Botany Bay.

269 M. CYLINDRACEA, Reeve, P.Z.S., 1844, Conch. Icon., Vol. II., pl. xiii., sp. 97. Under stones at Double Bay, (Brazier).
270 M. RHODIA, Reeve, Conch. Icon., Vol. II., pl. xxviii., f. 225; Tryon, M. C., Vol. IV., p. 127, pl. 37, f. 114. P.J., 2-10 fms., (' Challenger.")
271 M. PACIFICA, Reeve ; Sow., Thes. Conch.., pts. xxi.-xxii., pl. ccclix, f. 388. Outer North Head, 5 fms., (Brazier.)

Family MARGINELLIDÆ.

272 ERATO ANGIOSTOMA, Sowerby, Conch. Ill., p. 51, 1841; Tryon, M.C., Vol. V., p. 10, pl. iv., f. 44. Outside P.J. Heads, 45 fms., (Brazier.)
273 E. CORRUGATA, Hinds, MS., Reeve, Conch. Icon., Vol. xv., pl. iii.., f. 12; Tryon, M.C., Vol. v., p. 11, pl, iv., f. 52. Vaucluse Bay, sandy mud, 8 fms., (Brazier).
274 MARGINELLA MUSCARIA, Lam.; Reeve, Conch. Icon., Vol. xv., pl. viii., f. 29 a, b. In shell-sand, Middle Harbour.
275 M. OLIVELLA, Reeve, Conch. Icon., Vol. xv., pl. xxv., f. 140 a-b, 1865. Sow and Pigs Reef.
276 M. TRANSLUCIDA, Sow., Thes. Conch., Vol. I., p. 376, pl. lxxv., f. 62-63. Sow and Pigs Reef.
277 M. TURBINATA, Sow., Thes. Conch., Vol. I., Marginella, p. 385, pl. lxx., f. 70-71. Dredged in Middle Harbour.
278 M. INFELIX, Jousseaume, Monograph, 1875, p. 75 ; Reeve, Conch. Icon., pl. xxii., f. 115, = *M. simplex.* Dredged in P.J.
279 M. OVULUM, Sowerby, Thes. Conch., Vol. I., p. 140, pl. lxxviii, f. 188. Dredged in P.J.
280 M. MUSTELINA, Angas, P.Z.S., 1871, p. 14, pl. i., f. 5. Sow and Pigs Reef, P.J.
281 M. ANGASI, Brazier, MS., Crosse, Jour. de Conch., 1870, p. 304 ; Tryon, M.C., Vol. v., p. 45, pl. xii., f. 67. Bottle and Glass Rocks, (Brazier).
282 M. METCALFEI, Angas, P.Z.S., 1877, p. 173, pl. xxvi., f. 9. Sow and Pigs Reef, (Brazier).
283 M. STRANGEI, Angas, P.Z.S., 1877, p. 172, pl. xxvi., f. 8. P.J., (Brazier).
284 M. RUFULA, Gaskoin, MS. Reeve, Conch. Icon., Vol. xv., pl. xxvi., f. 149. Outside P.J. Heads, 45 fms., (Brazier.)
286 M. OCHRACEA, Angas, P.Z.S., 1871, p. 14, pl. i., f. 6. In shell-sand, Botany Bay.
286 M. AGAPETA, Watson, C.R., Vol. xv., p. 266, pl. xvi., f. 9. Off P.J., 45 fms., ("Challenger.")

Family OLIVIDÆ.

287 OLIVELLA EXQUISITA, Angas, P.Z.S., 1871, p. 13, pl. i., f. 2 ; Tryon, M. Conch., Vol. v., p. 71, pl. xvii., f. 32, 33, 41. Middle Harbour ; in shell-sand, Coogee Bay, (Brazier.)

288 O. TRITICEA, Duclos, Monograph, pl. i., f. 5-6, 1835 ; Tryon, M.C., Vol. v., p. 72, pl. xvii., f. 42-44. Dredged in Watson's Bay.

289 O. LEUCOZONA, Ad. & Angas, l.c., p. 422, pl. xxxvii., f. 23 ; Tryon, M.C., Vol. v., p. 72, pl. xvii., f. 45. Dredged in P.J., 6 fms.

290 O. NYMPHA, Ad. & Angas, l.c., p. 422 ; Tryon, M.C., Vol. v., p. 72, pl. xvii., f. 46. Dredged in P.J.

291 O. BRAZIERI, Angas, P.Z.S., 1877, p. 172, pl. xxvi., fig. 6. Jervis Bay, 11 fms., (Brazier).

292 ANCILLARIA MARGINATA, Lam. ; Sowerby, Sp. Conch., pt. i., f. 40-43 ; Reeve, Conch. Icon., Vol. xv., pl. iii., f. 8 a-b ; Tryon, M.C., Vol. v., p. 96, pl. xxxix., f. 44-48. Sow and Pigs Reef.

293 A. OBLONGA, Sowerby, Sp. Conch., pt. i., p. 7, f. 38-39 ; Reeve, Conch. Icon., Vol. xv., pl. viii., f. 24 a-b. Dredged near P.J. Heads.

Family COLUMBELLIDÆ.

294 COLUMBELLA VERSICOLOR, Sowerby, P.Z.S., 1832, p. 119 ; Reeve, Conch. Icon., Vol. xi., pl. xi., f. 51 a-b ; Tryon, Vol v., p. 110, pl. xlv., f. 84-96. Under stones, Watson's Bay.

295 C. SEMICONVEXA, Lam.; Reeve, Conch. Icon., Vol. xi., pl. xviii., f. 95 a-b ; Tryon, M. Conch., p. 125, pl. xlviii., f. 87-93. Under stones Watson's Bay.

296 C. AUSTRALIS, Gaskoin, P.Z.S., 1851, p. 5 ; Reeve, Conch. Icon., Vol. xi., pl. xv., f. 78 a-b, and 188 ; Tryon, M.C., Vol. v., p. 126, pl. xlix., f. 97-98. Under stones, in company with the preceding species.

297 C. LINCOLNENSIS, Reeve, Conch. Iconn., Vol. xi., pl. xxix., f. 184 a-b ; Tryon, M.C., Vol. v., p. 120, pl. xlviii., f. 65. P.J.

298 C. TAYLORIANA, Reeve, Conch. Icon., Vol. xi., pl. xxxv., f. 225 a-b, 1859, = *C. albomaculata*, Angas, P.Z.S., 1867, p. 111, pl. xiii., f. 5 ; Tryon, M.C., Vol. v., p. 141, pl. li., f. 60-62. P.J.

299 C. PULLA, Gaskoin, P.Z.S., 1851, p. 6 ; Reeve, Conch. Icon., Vol. xi., pl. xix., f. 106 ; Tryon, M.C., Vol. v., p. 127, pl. xlix., f. 4-7. P.J.

300 C. SMITHI, Angas, P.Z.S., 1877, p. 172, pl. xxvi., f. 7, = *C. lentiginosa*, Angas, (non Hinds) P.Z.S., 1867, p. 195. Under stones at low water, P.J.

331 C. SPECIOSA, Angas, P.Z.S., 1877, p. 35, pl. v., f. 3 ; Tryon, M.C., Vol. v., p. 171, pl. lvii., f. 24. P.J., (Brazier).

302 C. EXIMIA, Reeve, Conch. Icon., Vol. XI., pl. XXXV., f. 222; Tryon, M.C., Vol. v., p. 150, pl. liii., f. 7-8. Under stones at Mossman's Bay; Bottle and Glass Rocks, (Brazier.)

303 C. ATTENUATA, Angas, P.Z.S., 1871, p. 14, pl. i., f. 4; Tryon, M.C., Vol. v., p. 151, pl. liii., f. 18. Dredged near Sow and Pigs Reef, (Brazier).

304 C. ATRATA, Gould, Otia. Conch., p. 131; Tryon, M.C., Vol. v., p. 169, pl. lvii., f. 10-17. Under stones, Mossman's Bay.

305 C. ANGASI, Brazier, P.Z.S., 1871, p. 322; Angas, P.Z.S., 1865, pl. xi., f. 9, 10 as *C interrupta*, Angas; Tryon, M. C., Vol. v., p. 128, pl. xlix., f. 11. P.J., (Brazier).

306 C. LINEOLATA, Pearse; Brazier, P.L.S., N.S.W., Vol. I., p. 231, 1877; Tryon, M.C., Vol. v., p. 138, pl. li. f. 53, = *C. dermestoides*, Angas, (non Kiener) P.Z.S., 1876, p. 195. Shark Island, P.J.

307 C. FILOSA, Angas, P.Z.S., p. 111, pl. xiii., f. 6, 1867; Tryon, M.C., Vol. v., p. 151, pl. liii., f. 17. Dredged in 5 fms., P.J., (Brazier).

Family CANCELLARIDÆ.

308 CANCELLARIA UNDULATA, Sow., Thes. Conch., Vol. II., p. 443, pl. xcii., f. 12; pl. xcv., f. 79. Middle Harbour.

309 C. ANTIQUATA, Hinds, Zoology of "Sulphur," p. 43, pl. xii., f. 17-18; Tryon, Man. Conch., Vol. VII., p. 79; pl. v., f. 88. Off Green Point, 7 fms., (Brazier).

310 C. COSTIFERA, Sow., Thes. Conch., Vol. II., p. 456, pl. xcv., f. 65, 66, 71; Tryon, Man. Conch., Vol. VII., p. 82, pl. vii., f. 12-13. Inner North Head, 8 fms., (Brazier).

Family TENEBRIDÆ.

311 TEREBRA BICOLOR, Angas, P.Z.S., 1867, p. 111, pl. xiii., f. 7; Tryon, M. C., Vol. VII., p. 25, (f. xi., only). Dredged in Middle Harbour.

312 T. ASSIMILIS, Angas, P.Z.S., 1867, p. 111, pl. xiii., f. 8; Tryon M.C., Vol. VII., p. 36, pl. xi., f. 1. Dredged.

313 T. BRAZIERI, Angas, P.Z.S., 1871, p. 16, pl. i., f. 15; Tryon, M.C., Vol. VII., p. 13, pl. xi., f. 14. Sow and Pigs Reef, 5 fms., (Brazier).

314 T. VENILIA, Ten-Woods, P L.S., N.S.W., Vol. IV., p. 23, pl. iv., f. 2, 2a; Tryon, M.C., Vol. VII., p. 21, pl. v., f. 88. Sow and Pigs Reef, (Brazier).

315 T. LAURETANÆ, Ten.-Woods, P.L.S., N.S.W., Vol. II.,p. 262. Dredged off P.J. Heads, 45 fms., (Brazier).

316 T. TRILINEATA, Adams & Angas, P.Z.S., 1863, p. 418, pl. XXXVII., f. 13; Tryon, M.C., Vol. VII., p. 38, pl. xii., f. 24. Dredged near the Heads.

317 T. ANGASI, Tryon, M.C., Vol. VII., p. 38, pl. xii., f. 25-26, 1885, = *T. pulchella*, Ads. & Angas, P.Z.S., p. 418, 1863, (non *T. pulchella*, Desh.) = *T. Brazieri*, Angas, P.Z.S., 1875, p. 390, pl. xlv., f. 5, 5a, (non *T. Brazieri*, Angas, 1871). Outside Sydney Heads, 43 fms., (Brazier); in shell-sand, Middle Harbour.

Family PLEUROTOMIDÆ.

318 PLEUROTOMA XANTHOPHÆS, Watson, C.R., Vol. XV., p. 282, pl. xxvi., f. 1. Station 163 B., 30 – 35 fms.

319 DRILLIA OWENI, Gray, MSS.; Reeve. Conch. Icon., Vol. I., pl. ix., sp. 70; Tryon, Man. Conch., Vol. VI., p. 242, pl. vii., f. 91. Sow and Pigs Reef, P.J., (Brazier).

320 D. RADULA, Hinds, Voy. of "Sulphur," p. 16, pl. v., f. 9; Tryon, M.C., Vol. VI., p. 242, pl. vii., f. 88, 89, 90. Deep water, P.J.

321 D. VEXILLUM, Reeve, P.Z.S., 1845, p. 115; Conch. Icon., Vol. I., pl. xxix., f. 264. Middle Harbour.

322 D. METCALFEI, Angas, P.Z.S., 1867, p. 113, pl. xiii., f. 16. Dredged in P.J., (Angas).

323 D. COXI, Angas, P.Z.S., 1867, p. 113, pl. xiii., f. 15. Dredged in P.J., (Brazier).

324 D. BERAUDIANA, Crosse, Jour. de Conch., 1863, p. 88, pl. i., f. 6. In shell-sand Middle Harbour; dredged.

325 D. ANGASI, Crosse, Jour. de Conch., 1863, p. 87, pl. i., f. 5; Tryon, Man. Conch., Vol. VI., p. 187, pl. ix., f. 36-37. Dredged.

326 D. TRICARINATA, Tenison-Woods, P.L.S., N.S.W., Vol. II., p. 265. Dredged off P.J. Heads, 45 fms., (Brazier).

327 D. AEMULA, Angas, P.Z.S., 1877, p. 36, pl. v., f. 9.

328 D. SPADIX, Watson, C.R., Vol. XV., p. 310, pl. xxvi., f. 6. Station 163 B, off Sydney, 35 fms., ("Challenger.")

329 BELA MITRALIS, Ad. & Angas, P.Z.S., 1863, p. 420. Dredged in P.J.

330 CLATHURELLA BRENCHLEYI, Angas, P.Z.S., 1877, p. 37, pl. v., f. 12; Tryon, Man. Conch., Vol. VI., p. 285, pl. xvii., f. 93.

331 C. RUFOZONATA, Angas, P.Z.S., 1877, p. 38, pl. v., f. 13; Tryon, M.C., Vol. VI., p. 285, pl. xvii., f. 100. Bottle and Glass Rocks, (Brazier).

332 C. PUSTULATA, Angas, P.Z.S., 1877, p. 38, pl. v., f. 14; Tryon M.C., Vol. VI., p. 285. pl. xvii., f. 85. P.J., (Brazier).

333 C. MODESTA, Angas, P.Z.S., 1877, p. 38, pl. v., f. 15; Tryon, M.C. Vol. VI., p. 285, pl. xvii., f. 92. P.J., (Brazier).

334 C. HAYESIANA, Angas, P.Z.S., 1871, p. 17, pl. i., f. 17; Tryon, M.C., Vol. VI., p. 281, pl. XV., f. 46. Dredged in Lane Cove River, (Brazier).

335 C. TENUILIRATA, Angas, P.Z.S., 1871, p. 17, pl. i., f. 18; Tryon, M.C., Vol. VI., p. 281, pl. xvi., f. 52. Dredged near Goat Island, P.J., 5 fms., (Brazier).

336 C. SCULPTILIS, Angas, P.Z.S., 1871, p. 17, pl. i., f. 19; Tryon, M.C., Vol. VI., p. 282, pl. xvi., f. 51. Dredged near Sow and Pigs Reef, (Brazier).

337 C. BICOLOR, Angas, P.Z.S., 1871, p. 18, pl. i., f. 20; Tryon, M.C. Vol. VI., p. 282, pl. xvi., f. 61. Dredged near Sow and Pigs Reef, (Brazier).

338 C. ALBOCINCTA, Angas, P.Z.S., 1871, p. 18, pl. i., f. 22; Tryon, M.C., Vol. VI., p. 285, pl. xvii., f. 84. Dredged near Sow and Pigs Reef, (Brazier).

339 C. BILINEATA, Angas, P.Z.S, 1871, p. 18, pl. i., f. 23; Tryon, M.C., Vol. VI., p. 288, pl. xvii., f. 4. Dredged near Sow and Pigs Reef, (Brazier).

340 C. BRAZIERI, Angas, P.Z.S., 1871, p. 18, pl. i., f. 21; Tryon, M.C., Vol. VI., p. 295, pl. xvii., f. 98. Dredged near Sow and Pigs Reef, (Brazier).

341 C. ZONULATA, Angas, P.Z.S., 1867, p. 113, pl. xiii., f. 17; Tryon, M.C., Vol. VI., p. 285, pl. xvii., f. 89. Dredged.

342 C. PEREGRINA, Gould, Otia. Conch., p. 134. P.J., (Brazier).

343 C. RETICOSTA, Ad. & Angas, P.Z.S., p. 420, 1863; Tryon, M.C., Vol. VI., p. 281. Dredged in Middle Harbour.

344 DAPHNELLA CREBRIPLICATA, Reeve, Conch. Icon., Vol. I., pl. XXXIV., f. 313; Tryon, M.C., Vol. VI., p. 305, pl. XXVI., f. 94. Dredged in P.J.

345 CITHARA COMPTA, Ad. & Angas, P.Z.S., 1863, p. 419, pl. XXXVII., f. 5; Tryon, M.C., Vol. VI., p. 306, pl. XXV., f. 49. In shell-sand, Middle Harbour.

346 MANGELIA PICTA, Ad. & Angas, P.Z.S., 1863, p. 419, pl. XXXVII., f. 7; Tryon, Man. Conch., Vol. VI., p. 256, pl. XXII., f. 72. Dredged in P.J.

347 M. LETOURNEUXIANA, Crosse, Jour. de Conch., 1865, p. 425, pl. xi., f. 7; Tryon, M.C.., Vol. VI., p. 286, pl. xvii., f. 86-87, ; pl. xxxiv., f. 99. Dredged in Middle Harbour.

348 M. VINCENTINA, Crosse, Jour. de Conch., 1865; Tryon, M.C., Vol. VI., p. 311, pl. xvii., f. 91. Dredged off P.J.; Middle Harbour; Cabbage Tree Bay, (Brazier).

349 M. ANOMOLA, Angas, P.Z.S., 1877, p. 34, pl. v., f. 1. (Purpura). In shell-sand, Middle Harbour; dredged outside P.J. Heads, 25 fms., (Brazier(.

350 M. JACKSONIENSIS, Angas, P.Z.S., 1877, p. 37, pl. v., f. 10; Tryon, M.C., Vol. VI., p. 311, pl. xxii., f. 73. Dredged outside P.J. Heads, 25 fms., (Brazier).

351 M. FLAVESCENS, Angas, P.Z.S., 1877, p. 37, pl. v., f. 11; Tryon, M.C.,Vol. VI., p. 256, pl. xxii., f. 68. P.J.(Brazier).

Family CONIDÆ.

352 CONUS MACULATUS, Sowerby, Thes. Conch., Vol. III., pl. xiii., f. 296, (*C. maculatus*); Tryon, M.C., Vol. VI., p. 7, pl. xxii., f. 56. Watson's Bay.

353 C. JUKESI, Reeve ; Sow., Thes. Conch., Vol. III., pl. xiii., f. 297 ; Tryon, M.C., Vol. VI., pl. 22, f. 58. Watson's Bay.

354 C. GRAYI, Reeve, P.Z.S., 1843, p. 179 ; Conch. Icon., pl. xlvi., f. 258 ; Tryon, M.C., Vol. VI., p. 84, pl. xxvi., f. 59, 60. Under stones, Middle Harbour.

355 C. APLUSTRE, Reeve, Conch. Icon., Vol. I., pl. xxx., f. 170 ; Tryon, M.C., Vol. VI., p. 67, pl. xxi., f. 40-41. Cape Solander, Botany Bay.

356 C. COOKI, Brazier, P.Z.S., 1870, p. 109. Cape Solander, Botany Bay.

357 C. ROSSITERI, Brazier, P.Z.S., 1870, p. 109 ; Tryon, M.C., Vol. VI., p. 69. Cape Solander, Botany Bay.

358 C. RUTILUS, Menke, Moll. Nov. Holl., p. 57, no. 133 ; Reeve, Conch. Icon., Vol. I., pl. xlvii., f. 264 ; Tryon, M.C., Vol. VI., p. 2, pl. vi., f. 3. Cape Solander, Botany Bay,(Brazier).

359 C. ANGASI, Tryon, Man. Conch., Vol. VI., p. 62, pl. xix., f. 99, = *C. Metcalfei*, Angas, P.Z.S., 1877, p. 174, pl. xxvi., f. 13. Sow and Pigs Reef, (Brazier).

360 C. SMITHI, Angas, P.Z.S., 1877, p. 36, pl. v., f. 8 ; Tryon, M.C., Vol. VI., p. 24, pl. vi., f. 4. Cape Solander, Botany Bay, (Brazier).

361 C. SYDNEYENSIS, Sowerby, Thes. Conch., Vol. V., p. 260, pl. dx., f. 694. Sow and Pigs Reef, (Brazier).

Family STROMBIDÆ.

362 STROMBUS LUHUANUS, Linn.; Reeve, Conch. Icon., Vol. VI., pl. ix., f. 10 ; Tryon, M.C., Vol. VII., p. 122, pl. viii., f. 91, 92. Vaucluse Bay.

363 S. FLORIDUS, Lam.; Reeve, Conch. Icon., Vol. VI., pl. vii., f. 11 a-b ; Tryon, M.C., Vol. VII., p. 119, pl. vii., f. 73-76, 80, 83. P.J.

364 S. ELEGANS, Sowerby, Thes. Conch., Vol. I., pl. vii., fig. 43, 48 ; Tryon, M.C., Vol. VII., p. 119, pl. vii., f. 71. Sow and Pigs Reef, (Brazier).

365 PTEROCERA SCORPIA, Linn.; Tryon, Man. Conch., Vol. VII., p. 125, pl. ix., f. 6. Bottle and Glass Rocks, (T. Rossiter).

366 STRUTHIOLA SCUTULATA, Martyn, Univ. Conch., Vol. II., pl. lv.; Reeve, Conch. Icon., Vol. VI., pl. i., f. 2 ; Tryon, M.C., Vol. VII., p. 134, pl. xii., f. 39-40. Watson's Bay.

Family CYPRÆIDÆ.

367 CYPRÆA UMBILICATA, Sowerby, in Tankerville Catalogue, 2260 ; Tryon, M.C., Vol. VII., p. 181, pl. xii., f. 65-66. Twofold Bay, 125 fms.

368 C. VITELLUS, Linn; Lister, Conch., pl. dcxciii., f. 40; Tryon, M.C., Vol. VII., p. 182, pl. xiii., f. 72-73. Taylor Bay; Watson's Bay.

369 C. CAPUT-SERPENTIS, Linn.; Lister, Conch., pl. dcci.-dccii., f. 49, 50; Tryon, M.C., Vol. VII., p. 173, pl. vi., f. 98-100. Manly.

370 C. CAPUT-ANGUIS, Philippi, Zeitschrift fur Malakozoologie, p. 24, 1849. Shark Island, P.J., (Brazier).

371 C. ASELLUS, Linn.; Brug., Encycl. Meth., pl. cccIvi., f. 5; Tryon, Man. Conch., Vol. VII., p. 187, pl. xvi., f. 34. Long Bay; Botany Heads, and P.J.

372 C. CLANDESTINA, Linn.; Wood, Index Test., pl. iii., f. 17; Tryon, M.C., Vol. VII., p. 187, pl. xvi., f. 37-40, 61. Manly Beach; Watson's Bay.

373 C. CARNEOLA, Linn.; Lister, Conch., pl. dcxliv., f. 8; Tryon, M.C., Vol. VII., p. 166, pl. iii., f. 26-30. Long Bay.

374 C. ERRONES, Linn.; Wood, Index Test., pl. xvii., f. 39; Tryon, M.C., Vol. VII., p. 183, pl. xiv., f. 88, 89, 7. Manly Beach.

375 C. FELINA, Gmelin; Wood, Index Test., pl. xvii., f. 26; Tryon, M.C., Vol. VII., p. 169, pl. iv., f. 52-55, 59, 60. North Head Botany Bay, (Brazier); Middle Harbour, (Angas).

376 C. PIPERATA, Gray; Sow., Conch. Ill., f. 24; Tryon, M.C., Vol. VII., 189, pl. xvi., f. 49, 50, 58. P.J.

377 C. MACULA, A. Adams; Sowerby, Thes. Conch., Vol. IV., pl. xxxii., f. 379-381; Tryon, M.C., Vol. VII., p. 169, pl. iv., f. 71-72. P.J.

378 C. CAURICA, Linn.; Lister, Conch., pl. dclxxvii., f. 24; Tryon, M.C., Vol. VII., p. 171, pl. v., f. 88, 89, 90. Cape Banks, Botany Bay, (Brazier).

379 C. ANNULUS, Linn.; Encycl. Meth., pl. cccIvi., f. 7; Tryon, M.C., Vol. VII., p. 178, pl. xi., f. 57-61, pl. xxiii., f. 70-72. Vaucluse Bay, (Brazier).

380 C. FIMBRIATA, Gmelin; Wood, Index Test., pl. xvii., f. 26; Tryon, M.C., Vol. VII., p. 168, pl. v., f. 76-78. Cape Banks, (Brazier).

381 C. ISABELLA, Linn.; Sowb., Thes. Conch., Vol. IV., p. 6, pl. xxvii., f. 258; Tryon, M.C., Vol. VII., p. 165, pl. i., f. 6-7. Farm Cove, (W.)

382 C. STAPHYLEA, Linn.; Lister, Conch., pl. dccviii., f. 58; Tryon, M.C., Vol. VII., p. 196, pl. xx., f. 39-44. Off Bottle and Glass Rocks, 8 fms., also Broken Bay, (Brazier).

383 C. LUTEA, Gronovius, Zoophylacium, pl. xix., f. 17; Tryon, M.C., Vol. VII., p. 187, pl. xvi., f. 35-37. Middle Harbour (Ed. McIntosh); Lake Macquarie Beach, (Brazier).

384 C. EROSA, Linn. ; Lister, Conch., pl. dcxcii., f. 39 ; Tryon, M.C., Vol. VII., p. 192, pl. 18, f. 90, 100, 1. Broken Bay, (Brazier).

385 C. TABESCENS, Gray ; Sow., Conch. Illus., f. 14 ; Tryon, M. C., Vol. VII., p. 170, pl. v., f. 82, 83, 84. Lake Macquarie Beach, (Brazier).

386 C. SCURRA, Chemnitz, Conch. Cab. p. 103, pl. cxliv., f. 1338; Tryon, M.C., Vol. VII., p. 165, pl. ii., f. 19, 20, 21. Broken Bay, (Brazier).

387 C. FLAVEOLA, Linn. ; Sow., Conch. Illus., f. 11 ; Tryon, M. C., Vol. VII., p. 195, pl. xix., f. 20, 21, 22. Botany Bay (Brazier).

388 C. XANTHODON, Gray ; Desc., Cat., p. 10, 1832 ; Tryon, M C., Vol. VII., p. 186, pl. xv., f. 24, 25. Watson's Bay, (Angas).

389 TRIVIA AUSTRALIS, Lam.; Sow., Conch. Illus., f. 29 ; Tryon, M.C., Vol, VII., p. 206, pl. xxiii., f. 53, 54.

390 T. ORYZA, Lam., Anim. sans Vert., (Desh., Ed.) Vol. x., p. 158 ; Tryon, M.C., Vol. VII., p. 200, pl. xxi., f. 79, 82, 83; Sowerby, Thes. Conch., Vol. IV., pl. xxxv., f. 474, 476. Bottle and Glass Rocks, (Brazier).

391 T. GLOBOSA, Gray ; Sow., Conch. Illus., f. 34 ; Tryon, M.C., Vol. VII., p. 200, pl. xxi., f. 92, 93. Little Bay, (Brazier).

392 T. INSECTA, Mighels ; Sow , Thes. Conch., Vol. IV., pl. xlvi., f. 477, 478, 479 ; Tryon, M.C., Vol. VII., p. 200, pl. xxi., 84, 85. Little Bay, (Brazier).

393 OVULA ANGASI, A. Adams, MS. ; Reeve, Conch. Icon., Vol. XV., pl. x., f. 43 a-b ; Tryon, M.C., Vol. VII., p. 252, pl. iv., f. 3, 4. Watson's Bay.

394 O. HORDACEA, Lam. ; Tryon, Man. Conch., Vol. VII., p. 254, pl. v., f. 31, 38. P.J.

395 O. DENTATA, Adams & Reeve, Zool. Voy. "Samarang," p. 21, pl. vi., fig. 4 a-b. Sow and Pigs Reef, (Brazier).

Family CASSIDIDÆ.

396 CASSIS ACHATINA, Lam.; Reeve, Conch. Icon., Vol. v., pl. x., f. 28 a-b ; Tryon, M.C., Vol. VII., p. 287, pl. viii., f. 94, 98, pl. ix., f. 7. P.J.

397 C. PYRUM, Lam. ; Reeve, Conch. Icon., Vol. v., pl. xi., f. 29 a-b; Tryon, M.C., Vol. VII., p. 278, pl. viii., f. 96-98. P.J.

398 C. PILA, Reeve, Conch. Icon., Vol. v., pl. ix., f. 21 ; Tryon, M.C., Vol. VII., p. 275, pl. v., f. 75. P.J., 2 – 10 fms., ("Challenger.")

399 C. THOMSONI, Brazier, P.L.S., N.S.W., Vol. I., p. 8. Off P.J., 45 fms. (Brazier).

Family DOLIIDÆ.

400 Dolium variegatum, Lam., Anim. sans Vert., (Ed. Desh.) Vol. x., p. 143 ; Tryon, M.C., Vol. vii., p. 262, pl. iii., f. 13-14. Middle Harbour ; off George's Head, 17 fms., (Brazier).

Family NATICIDÆ.

401 Natica sagittata, Menke, Moll. Nov. Holl., p. 10, no. 30 ; Philippi, Conch. Cab., (ed. Kuster) p. 108, pl. xv., f. 14. Middle Harbour.

402 N. euzona, Recluz, Jour de Conch., 1851, Vol. i., p. 381, pl. xiv., f. 3. P.J., 2 – 10 fms., ("Challenger.")

403 N. plumbea, Lam.; Reeve, Conch. Icon., Vol. ix., pl. ix., f. 24 a-b ; Tryon, M.C., Vol. viii., p. 44, pl. xviii., f. 78, 79, pl. xix., f. 88. Middle Harbour ; Botany Bay.

404 N. melostoma, Swainson ; Reeve, Conch. Icon., Vol. ix., pl. xviii., f. 78 ; Tryon, M.C., Vol. viii., p. 45, pl. xviii., f. 81, pl. xix., f. 90 a-b, pl. xxi., f. 8.

405 N. Strangei, Reeve, Conch. Icon., Vol. ix., pl. xviii., f. 81 ; Tryon, M.C., Vol. viii., p. 45, pl. xviii., f. 80. P.J.

406 N. didyma, Bolton, MS. ; Philippi, Conch. Cab., (ed. Kuster) p. 6, sp. 1, pl. i., f. 4 ; Tryon, M.C., Vol. viii.. p. 33, pl. x., f. 81. P.J.

407 N. conica, Lam.; Reeve, Conch. Icon., Vol. ix., pl. xii., f. 48; Tryon, M.C, Vol. viii., p. 44, pl. 18, f. 76, 77. On the sand spit, Middle Harbour.

408 N. Incei, Philippi, P.Z.S., 1851, p. 233 ; Reeve, Conch. Icon., Vol. ix., pl. xx., f. 10 ; Tryon, M.C., Vol. viii., p. 33, pl. x., f. 87-90, pl. xi., f. 95. Manly Beach.

409 N. areolata, Recluz, P.Z.S., p. 206, 1843 ; Tryon, M.C., Vol. viii., p. 25, pl. vi., f. 23. In shell sand, Middle Harbour ; Sow and Pigs Reef.

410 N. effossa, Watson, C.R., Vol. xv., p. 439, pl. xxviii., f. 3. Off P.J., 30 – 35 fms., ("Challenger.")

411 N. filosa, Sowerby, MS. ; Reeve, Conch. Icon., Vol. ix., pl. xvii., f. 72 a-b ; Tryon, M.C.. Vol. viii., p. 51, pl. xxii., f. 22. Farm Cove, 5 fms.

412 N. Colliei. Recluz, P.Z.S., p. 206, 1843 ; Reeve, Conch. Icon., Vol. ix., pl. xxiv., f. 112 ; Tryon, M.C., Vol. viii., p. 26, pl. vii., f. 34, 30-33. Parramatta River, 7 fms., (Brazier.)

413 N. umbilicata, Quoy & Gaim., Astrolabe, Vol. ii., p. 234, pl. lxvi., f. 22, 23 ; Tryon, M.C., Vol. viii., p. 52, pl. xxii., f. 26. Dredged at Sow and Pigs Reef.

414 N. polita, Ten.-Woods, P.R. Soc., Tasmania, 1875, p. 23. Off P.J. Heads, 45 fms., (Brazier).

415 N. SUBCOSTATA, Ten.-Woods, P.L.S., N.S.W., Vol. II., p. 263. Dredged off P.J., 45 fms., (Brazier).

416 AMAUROPSIS MORCHII, Ads. & Angas, P.Z.S., 1863, p. 423. Under stones, Point Piper, (Brazier).

417 SIGARETUS ZONALIS, Quoy et G. Astrolabe, Vol. II., p. 221, pl. lxvi., (bis) f. 1-3; Tryon, M.C., Vol. VIII., p. 55, pl. xxiv., f. 57. P.J.; Botany Bay.

418 S. NITIDUS, Reeve, Conch. Icon., Vol. XV., pl. iv., f. 20 a-b; Tryon, M.C., Vol. VIII., p. 58, pl. XXV., f. 87. Dredged near Spectacle Island.

419 S. COARCTATA, Reeve, Conch. Icon., Vol. XV., pl. iv., f. 17 a-b; Tryon, M.C., Vol. VIII., p. 58, pl. XXV., f. 79. Off Fort Macquarie, P.J.

420 MARSENIA INDICA, Leach; Angas, P.Z.S., 1867, p. 199. Bottle and Glass Rocks, (Brazier); found on the beach at Coogee, (Angas).

421 VANIKORO DESHAYESIANA, Recluz; Reeve, Conch. Icon., Vol. XX., pl. ii., f. 12 a-b; Tryon, M.C., Vol. VIII., p. 68, pl. XXIX., f. 69. Very rare, Watson's Bay.

422 V. GRANULOSA, Recluz, P.Z.S., 1843, p. 140; Reeve, Conch. Icon., Vol. XX., pl. ii., f. 16; Tryon, M.C., Vol. VIII., p. 68, pl. XXIX., f. 74. P.J.

423 V. RECLUZIANA, Ad. & Angas, P.Z.S., 1863, p. 424; Reeve, Conch. Icon., Vol. XX., pl. iii., f. 18 a-b; Tryon, M.C., Vol. VIII., p. 70, pl. XXIX., f. 87. Under stones, Camp Cove, very rare.

424 V. CUVIERIANA, Recluz, Guerin's Mag. 1845, p. 63; Tryon, Man. Conch., Vol. VIII., p. 70, pl. XXIX., f. 94. P.J.

425 V. GAIMARDI, A. Adams; Reeve, Conch. Icon., Vol. XX., pl. ii., f. 9; Tryon, M.C., Vol. VIII., p. 70, pl. XXIX., f. 91. Botany Bay; P.J.

Family CALYPTRAEIDÆ.

426 GALERUS PELLUCIDUS, Reeve, Conch. Icon., Vol. XI., pl. i., f. 2; Tryon, M.C., Vol. VIII., p. 120, pl. XXXIV., f. 60-61. Adhering to dead shells in deep water, P.J.

427 INFUNDIBULUM CALYPTRAEFORMIS, Lam.; Reeve, Conch. Icon., Vol. XI., pl. iii., f. 11; Tryon, M.C., p. 122, pl. XXXV., f. 96-99. P.J.

428 CALYTRAEA POROSA, Reeve, Conch. Icon., Vol. XI., pl. v., f. 20; Tryon, M.C., Vol. VIII., p. 138, pl. xliii., f. 65-66. Sow and Pigs Reef, 4 fms., (Brazier.)

429 CREPIDULA ACULEATA, Gmelin; Tryon, M.C., Vol. VIII., p. 129, pl. XXXIX., f. 61-65. P.J.

430 C. UNGUIFORMIS, Lam. ; Brod., Trans. Zool. Soc., Vol. I., p. 204, pl. xxix., f. 4 ; Tryon, M.C., Vol. VIII., p. 130, pl. xxxix., f. 66-68 ; Reeve, Conch. Icon., Vol. XI., pl. i., f. 1. In a shell of *Turbo undulata*, associated with an hermit crab. Watson's Bay, March, 1888. (W.)

431 CAPULUS VIOLACEUS, Angas, P.Z.S., 1867, p. 114, pl. xiii., f. 23; Tryon, M.C., Vol. VIII., p. 132, pl. xxxix., f. 81. Found under a stone at low water, Long Bay, (Angas).

432 HIPPONYX ANTIQUATUS, Linn., 12th edit., p. 1259, no. 762, = *H. foliacea*, Quoy & Gaimard, Astrolabe, Vol. III., p. 439, pl. lxxii., f. 41-45 ; Tryon, M.C., Vol. VIII., p. 134, pl. xl., f. 93-99. Under rocks and stones, P.J.

433 H. SUBRUFUS, Sow., P.Z.S., 1835, p. 5 ; Thes. Conch., Vol. I., p. 370, pl. lxxiii., f. 21, 22, 23 ; Tryon, M.C., Vol. VIII., p. 134, pl. xl., f. 1. P.J.

Family SOLARIIDÆ.

434 SOLARIUM LAEVIGATUM, Lam.; Tryon, Man. Conch , Vol. IX., p. 12, pl. iv., f. 43-44. Dredged at Sow and Pigs Reef.

435 S. REEVEI, Hanley ; Sow., Thes. Conch., Vol. II., sp. 16, pl. i., f. 9, 10 ; Tryon, M.C., Vol. IX., p. 12, pl. iv., f. 45-46. P.J.

436 S. PERSPECTIVINCULUS, Chemnitz ; Sow., Thes. Conch., Vol. II., p. 237, pl. v., fig. 60-61-62. Botany Heads.

437 S. STRAMINEA, Chem., Conch. Cab., Vol. v., p. 172, f. 1699; Tryon, M.C., Vol. IX., p. 19, pl. vi., f. 93-96.

438 S. LUTEUM, Lam. ; Sow., Thes. Conch. Vol. II., sp. 25, pl. iv., f. 52, 54 ; Tryon, M.C., Vol. IX., p. 19, pl. v.. f. 71-72. Botany Heads ; P.J.

439 S. HYBRIDUM, Lam. Encycl. Method., pl. ccccxlvi., f. 5-6 ; Tryon, M.C., Vol. IX., p. 14, pl. v., f. 59-62. Coogee Bay, under stones, (Brazier): in shell sand Middle Harbour.

440 S. ROSULENTUM, Watson, C.R., Vol. XV., p. 136, pl. viii., f. 12; Tryon, M.C., Vol. IX., p. 23, pl. vi., f. 34. P.J., 2 – 10 fms., ("Challenger.")

441 ADEORBIS ANGASI, A. Adams, P.Z.S., 1863, p. 424, pl. xxxvii., f. 11-12 ; Tryon, Man. Conch., Vol. x., p. 85, pl. xxx., f. 98-99. Coogee Bay, (Angas) ; Bottle and Glass Rocks, (Brazier).

Family SCALARIDÆ.

442 SCALARIA PRETIOSA, Lam. ; Sowerby, Thes. Conch., Vol. I., pl. xxxii., f. 17 ; Tryon, Man. Conch., Vol. IX., p. 54, pl. xi., f. 31. In shell sand, Middle Harbour.

443 S. RUBRO-LINEATA, Sowb., Thes. Conch., Vol. I., pl. xxxiv., f. 83-84 ; Tryon, M.C., Vol. IX., p. 60, pl. xii., f. 82-83. Dredged in deep water P.J.

444 S. PHILIPPINARUM, Sow., P.Z.S., 1844; Thes. Conch., Vol. I., pl. xxxii., f. 1-3; Tryon, M.C., Vol. IX., p. 66, pl. xiii., f. 18-19. Dredged in P.J.

445 S. JUKESIANA, Forbes, Append. Voy. of "Rattlesnake," p. 383, pl. iii., f. 7; Tryon, M.C., Vol. IX., p. 66, pl. xiv., f. 20. Dredged.

446 S. AUSTRALIS, Lam.; Sow., Thes. Conch., Vol. I., pl. xxxv., f. 135; Tryon, M.C., Vol. IX., p. 76, pl. xvi., f. 90. Under stones, Farm Cove; Manly Beach.

447 S. ACULEATA, Sowerby, P.Z.S., 1844, p. 12; Thes. Conch., Vol. I., pt. 4, p. 86, pl. xxxii., f. 35 37; Tryon, M.C., Vol. IX., p. 63, pl. xiii., f. 90-91. P.J., 2-10 fms. ("Challenger.")

448 S. HYALINA, Sow., Thes. Conch., Vol. I., p. 85, pl. xxxii., f. 21-22; Tryon, M.C., Vol. IX., p. 57, pl. xi., f. 53-54. Sow and Pigs Reef, 5 fms., (Brazier).

449 S. GRANULOSA, Quoy; Sowerby, Thes. Conch., Vol. I., p. 104, pl. xxxv., f. 144; Tryon, M.C., Vol. IX., p. 80, pl. xvi., f. 11. Inner North Head, 12 fms., (Brazier).

450 S. PERPLEXA, Pease, Proc. Zool. Soc., 1860; Donum Bismarkianum, p. 24, pl. i., f. 19; Tryon, M.C., Vol. IX., p. 74, pl. xv., f. 83. P.J.; Broken Bay.

451 S. PYRAMIDALIS, Sow., Thes. Conch., Vol. I., p. 85, pl. xxxii., f. 4; Tryon, M.C., Vol. IX., p. 62, pl. xiii., f. 89. Inner North Head, 12 fms., (Brazier).

452 S. MORCHI, Angas, P.Z.S., 1871, p. 15, pl. i., f. 17; Tryon, M.C., Vol. IX., p. 82, pl. xvi., f. 7. Dredged near Sow and Pigs Reef, (Brazier).

453 S. BICARINATA, Sowb., Thes. Conch., Vol. I., p. 104, pl. xxxv., f. 113, 114; Tryon, M.C., Vol. IX., p. 82, pl. xvii., f. 28. Ball's Head, 18 fms., (Brazier).

454 S. DELICATULA, Crosse et Fischer, Jour. de Conch., 1864, p. 347, pl. iii., f. 11-12; Tryon, M.C., Vol. IX., p. 69, pl. xiv., f. 39. Sow and Pigs Reef, 5 fms. (Brazier).

455 CROSSEIA CONCINNA, Angas, P.Z.S., 1867, p. 911, pl. xliv., f. 14; Tryon, M.C., Vol. IX., p. 85, pl. xvii., f. 45. Sow and Pigs Reef, (Brazier); in shell sand, Middle Harbour.

Family IANTHINIDÆ.

456 IANTHINA FRAGILIS, Lam.; Reeve, Conch. Icon., Vol. XI., pl. ii. f. 6 a-b; Tryon, M.C., Vol. IX., p. 36, pl. ix., f. 94-5, pl. x., f. 6-10.

457 I. VIOLACEA, Bolton, Virg. p. 93, no. 953, 1798, = *I. casta*, Reeve, Conch., Icon., Vol. XI., pl. i., f. 4 a-b; Tryon, M.C., Vol. IX., p. 36, pl. ix., f. 95.

458 I. CAERULATA, Reeve, Conch. Icon., Vol. XI., pl. ii., f. 7, 7a; Tryon, M.C., Vol. IX., p. 36, pl. ix., f. 96. Bondi Bay.

459 I. GLOBOSA, Swainson, var. DECOLLATA, Carpenter; Reeve, Conch. Icon., pl. iv., f. 19 a-b; Tryon, M.C., Vol. IX., pl. x., f. 13. Coogee Bay; Bondi Bay.

460 I. EXIGUA, Lam.; Reeve, Conch. Icon., Vol. XI., pl. v., f. 21 a-b; Tryon, M.C., Vol. IX., p. 37, pl. x., f. 17-22. Coogee Bay; Bondi Bay.

Family TURRITELLIDÆ.

461 TURRITELLA INCISA, Reeve, Conch. Icon., Vol. v., pl. xi., f. 65; Tryon, M.C., Vol. VIII., p. 203, pl. 63, f. 88. Dredged in deep water. P.J., (Strange).

462 T. SOPHIE, Brazier, P.L.S., N.S.W., Vol. VIII., p. 227, = *T. incisa*, Tenison-Woods, (non Reeve) P.L.S., N.S.W., Vol. II., p. 262, 1877. Off P.J., 45 fms., (Brazier).

463 T. GUNNII, Reeve, Conch. Icon., Vol. v., pl. ix., fig. 45; Tryon, M.C., Vol. VIII., p. 203, pl. lxiii., f. 86, 87. Off P.J., 45 fms., (Brazier).

464 T. SINUATA, Reeve, Conch. Icon., Vol. v., pl. xi., f. 62; Tryon, M.C., Vol. VIII., p. 200, pl. lxi., f. 60. Dredged in Middle Harbour and Watson's Bay.

465 T. PARVA, Angas, P.Z.S., 1877, p. 174, pl. xxvi., f. 17; Tryon, M.C., Vol. VIII., p. 198, pl. lix., f. 41. Sow and Pigs Reef, (Brazier).

466 T. CIRCINATA, A. Adams, Ann. & Mag. N. Hist., 1860. Sow and Pigs Reef and Ball's Head.

467 T. SPINA, Crosse & Fischer, Jour. de Conch., 1864, p. 347; 1865, p. 44, pl. iii., f. 13-14. Sow and Pigs Reef, (Brazier).

468 T. BRAZIERI, Angas, P.Z.S., 1877, p. 35, pl. v., f. 5. P.J., (Brazier).

469 T. TORCULARIS, Ten.-Woods, P.L.S., N.S.W., Vol. II., p. 263. Off P.J., Heads, 45 fms., (Brazier).

470 MATHILDA ELEGANTULA, Angas, P.Z.S., 1871, p. 15, pl. i., f. 8; Tryon, M.C., Vol. VIII., p. 210, pl. lxv., f. 37. Dredged in Lane Cove River, (Brazier).

Family VERMETIDÆ.

471 VERMETUS DECUSSATUS, Gmelin; Tryon, Man. Conch., Vol. VIII., p. 181, pl. liii., f. 71-72. P.J.

472 V. QUOYI, A. Adams; Tryon, Man. Conch., Vol. VIII., p. 176, pl. li., f. 46. P.J.

473 SILIQUARIA LACTEA, Lam.; Tryon, M.C., Vol. VIII., p. 191, pl. lviii., f. 26. P.J.

Family CAECIDÆ.

474 CAECUM SP. Cabbage Tree Bay; outer Manly Beach in shell-sand.

Family EULIMIDÆ.

475 EULIMA PROXIMA, Sow., Conch. Icon., Vol. xv., pl. vi., f. 48; Tryon, M.C., Vol. VIII., p. 269, pl. lxviii., f. 11. Dredged in P.J.

476 E. ACICULA, Gould ; Tryon, M.C., Vol. VIII., p. 282, pl. lxx., fig. 92. P.J.

477 E. DISSIMILIS, Watson, C.R., Vol. xv., p. 522, pl. xxxvii., f. 5. P.J. 2 – 10 fms., ("Challenger.")

478 E. GUENTHERI, Angas, P.Z.S., 1877, p. 35, pl. v., f. 6. N.S.W.

479 LEIOSTRACA MUCRONATA, Sow., Conch. Icon., Vol. xv., pl. vi., f. 42; Tryon, M.C., Vol. VIII., p. 284, pl. lxx., f. 5. Dredged in P.J.

480 L. ACUTISSIMA, Sow., Conch. Icon., Vol. xv., pl. ii., f. 10 a-b ; Tryon, M.C., Vol. VIII., p. 281, pl. lxx., f. 89-90. P.J.

481 L. LESBIA, Angas, P.Z.S., 1871, p. 16, pl. i., f. 14. Dredged at Sow and Pigs Reef, (Brazier).

482 STYLIFER BRAZIERI, Angas, P.Z.S., 1877, p. 173, pl. xxvi., f. 12 ; Tryon, M.C., Vol. VIII., p. 291, pl. lxxi., f. 47. Sow and Pigs Reef, parasitic on a Starfish (*Anthenea acuta*, Perrier), (Brazier).

Family TURBONILLIDÆ.

483 TURBONILLA FESTIVA, Angas, P.Z.S., 1877, p. 35, pl. v., f. 4 ; Tryon, M.C., Vol. VIII., p. 334, pl. lxxvi. f. 45. Dredged in deep water, (Brazier).

484 T. MARIÆ, Ten.-Woods, P.R.S., Tasm., 1875, p. 144 ; Tryon, M.C., Vol. VIII., p. 334, pl. lxxvi., f. 42. Botany Heads.

485 T. HOFMANI, Angas, P.Z.S., 1867, p. 112, pl. xiii., f. 9 ; Tryon, M.C., Vol. VIII., p. 334, pl. lxxvi., f. 41. Dredged in P.J.

486 EULIMELLA AURANTICA, Angas, P.Z.S., 1867 p. 112, pl. xiii., f. 14 ; Tryon, M.C., Vol. VIII., p. 313, pl. lxxiv., f. 40. P.J.

487 ODOSTOMIA SIMPLEX, Angas, P.Z.S., 1871, p. 15, pl. i., f. 10. (*T. nitida*, see P.Z.S., 1877, p. 183) ; Tryon, M.C., Vol. VIII., p. 363, pl. lxxix., f. 71. Dredged near Sow and Pigs Reef, (Brazier.)

488 O. CASTA, A. Adams, P.Z.S., 1851, p. 223 ; Sow., Thes. Conch., Vol. II., p. 818, pl. clxxii, f. 22.

489 O. SCALPIDENS, Watson, C.R., Vol. xv., p. 489, pl. xxxii., f. 1. P.J., 2 – 10 fms., ("Challenger.")

490 O. LÆVIS, Angas, P.Z.S., 1867, p. 112, pl. xiii., f. 10 ; Tryon, M. Conch., Vol. VIII., p. 362, pl. lxxix., f. 67. Dredged in deep water, P.J.

491 O. ANGASI, Tryon, M.C., Vol. VIII., p. 362, pl. lxxix., f. 68, = *O. lactea*, Angas, P.Z.S., p. 112, pl. xiii., f. 11, 1867. Dredged in deep water, P.J., (Angas).

492 O. Pascœi, Angas, P.Z.S., 1867, p. 112, pl. xiii., f. 12; Tryon, M.C., Vol. viii., p. 362, pl. lxxix., f. 70. Dredged in deep water, P.J., (Angas).

493 O. Kreffti, Angas, P.Z.S., 1867, p. 112, pl. xiii., f. 13; Tryon, M.C., Vol. viii., p. 362, pl. lxxix., f. 66. Dredged in deep water, P.J., (Angas).

494 Oscilla ligata, Angas, P.Z.S., 1877, p. 173, pl. xxvi., f. 11; Tryon, M.C., Vol. viii., p. 310, pl. lxxiv., f. 29. Botany Bay, (Brazier).

495 Syrnola tincta, Angas, P.Z.S., 1871, p. 15, pl. i., f. 11; Tryon, M.C., Vol. viii., p. 308, pl. lxxiii., f. 24, Dredged off Sow and Pigs Reef, (Brazier.)

Family PYRAMIDELLIDÆ.

496 Pyramidella jucunda, Angas, P.Z.S., 1877, p. 173, pl. xxvi., f. 10; Tryon, M.C., Vol. viii., pl. lxxiii., f. 92. Dredged in deep water, P.J., (Brazier.)

Family LITTORINIDÆ.

497 Littorina scabra, Linn.; Tryon, Man. Conch., Vol. ix., p. 243, pl. xlii., f. 18-20. Mangrove Swamps, Parramatta River.

498 L. badia, Ten.-Woods, P.L.S., N.S.W., Vol. ii., p. 264. Dredged off P.J. Heads, 45 fms. (Brazier).

499 L. Mauritiana, Lam., Anim. sans Vert., Vol. ii., p. 244; Tryon, M.C., Vol. ix., p. 247, pl. xliv., f. 71, 70-75. Very common about high water mark, P.J.

500 Tectarius nodulosus, Gmelin, = *T. pyramidalis*, Quoy & Gaim., Astrolabe, Vol. ii., p. 482, pl. xxxiii., f. 12-15; Tryon, M.C., Vol. ix., p. 258, pl. xlvii., pl. xlviii. Common on rocks about high water-mark, P.J.

501 Risella lutea, Quoy & Gaim., Astrolabe, Vol. iii., p. 271, pl. lxii., f. 8-11; Tryon M.C., Vol. ix., p. 262, pl. xlix., f. 3, P.J.

502 R. plana, Quoy & Gaim., l.c., p. 274, pl. lxii., f. 13-14; Tryon, Man. Conch., Vol. ix., p. 262, pl. xlix., f. 10, 11, 12. P.J.

503 R. nana, Quoy & Gaim., l.c., p. 273, pl. lxii., f. 5-7; Tryon, M.C., Vol. ix., p. 262, pl. xlix., f. 13, 14, 99. P.J.

504 Fossarus patula, A. Adams & Angas, P.Z.S., 1863, p. 424, pl. xxxvii., f. 9-10; Tryon, M.C., Vol. ix., p. 276, pl. li., f. 2 a. Under stones, Watson's Bay.

505 F. Brazieri, Angas, P.Z.S., 1871, p. 18, pl. i., f. 24; Tryon, M.C., Vol. ix., p. 275, pl. lii., f. 17. Under stones, Shark Island, (Brazier).

Family PLANAXIDÆ.

506 PLANAXIS MOLLIS, Sowerby, Genera of Shells, Vol. II., pl. ccix., f. 2 ; Tryon, M.C., Vol. IX., p. 279, pl. lii., f. 34, 35, 29. Under stones, Coogee Bay ; Bondi Bay.

507 ALABA PHASIANELLA, Angas, P.Z.S., 1867, p. 113, pl. xiii., f. 18 ; Tryon, M.C., Vol. IX., p. 283, pl. liii., f. 84. Dredged in P.J.

Family CERITHIIDÆ.

508 CERITHIUM RHODOSTOMA, A. Adams ; Sow., Thes. Conch., Vol. II., pl. clxxx., f. 103 ; Tryon, M.C., Vol. IX., p. 14 1 pl. xxvii., f. 20. Sow and Pigs Reef, (Brazier).

509 C. MORUS, Lam. ; Kiener, Coquille, Viv., p. 52. pl. xv., f. 1 ; Tryon, M.C., Vol. IX., p. 133, pl. xxiv., f. 32, 33, 29, 31, 35, 37, 40-41, 43, 45 ; pl. xxv., f. 55, 57, 58, 65, 66. P.J.

510 C. SEROTINUM, A. Adams ; Thes. Conch., Vol. II., p. 861, f. 102 ; Tryon, M.C., Vol. IX., p. 141, pl. xxvii., f. 19. P.J.

511 CERITHIOPSIS ANGASI, O. Semper, Cat. Mus. Godeffroy 5, p. 108, no. 6882, 1874 ; Tryon, M.C., Vol. IX., p. 172, pl. xxxvi., f. 49. Sow and Pigs Reef, (Brazier).

512 C. PURPUREA, Angas, P.Z.S., 1877, p. 36, pl. v., f. 7 ; Tryon, M.C., Vol. IX., p. 175, pl. xxxvi., f. 67. Dredged off Shark Island, (Brazier).

513 C. CROCEA, Angas, P.Z.S., 1871, p. 16, pl. i., f. 13 ; Tryon, M.C., Vol. IX., p. 175. pl. xxxvi., f. 66. Dredged off Camp Cove, (Brazier).

514 BITTIUM GRANARIUM, Kiener, Coquille Viv., p. 72, pl. xix., f. 3 ; Tryon, M.C., Vol. IX., p. 155, pl. xxx., f. 98. Common under stones, P.J.

515 B. TURRITELLIFORMIS, Angas, P.Z.S., 1877, p. 174, pl. xxvi., f. 14 ; Tryon, M.C., Vol. IX., p. 154, pl. xxx., f. 13. P.J., (Brazier.)

516 B. LACERTINUM, Gould, Otia. Conch., p. 141 ; Tryon, M.C., Vol. IX., p. 155, pl. xxx., f. 100. P.J.

517 C. (BITTIUM) CYLINDRICUM, Watson, C.R., Vol. XV., p. 550, pl. xxxix., f. 5 ; Tryon, M.C., Vol. IX., p. 156, pl. xxx., f. 18. P.J., 2 – 10 fms., ("Challenger.")

518 C. (BITTIUM) FURVUM, Wat., C.R., p. 556, pl. xxxviii., f. 5 ; Tryon, M.C., Vol. IX., p. 157, pl. xxxi., f. 27. P.J., 2 – 10 fms., ("Challenger.")

519 TRIFORIS MACULOSUS, A. Adams ? Angas, P.Z.S., 1877, p. 184. P.J., (Brazier).

520 T. GRANULATUS, Adams & Reeve, Voy. of "Samarang," p. 46, pl. xi., f. 33 ; Tryon, M.C., Vol. IX., p. 183, pl. xxxviii., f. 19.

521 T. NIGROFUSCUS, A. Adams, P.Z.S., 1851, p. 278. Under stones at low water, P.J.

522 T. LABIATUS, A. Adams, P.Z.S., 1851, p. 279. Under stones at low water, P.J.

523 POTAMIDES EBENINUM, Brug., Encyl. Meth., pl. ccccxlii., f. 1 a-b ; Tryon, M.C., Vol. IX., p. 158, pl. xxxi., f. 31. Very common on mud flats, P.J.

524 P. (LAMPANIA) AUSTRALIS, Quoy & Gaim., Astrolabe, Vol. III., p. 131, pl. lv., f. 7 ; Tryon, M.C., Vol. IX., p. 166, pl. XXXIV., f. 99, 100. Common in muddy places, P.J.

Family RISSOIDÆ.

525 RISSOINA VARIEGATA, Angas, P.Z.S., 1867, p. 113, pl. xiii., f. 19 ; Tryon, M.C., Vol. IX., p. 370, pl. liii., f. 43-46. Dredged in deep water, P.J.

526 R. ANGASI, Pease, = *R. turricula*, Angas, P.Z.S., p. 114, pl. xiii., f. 20, 1867. Dredged in deep water, P.J.

527 R. CINCTA, Angas, P.Z.S., 1867, p. 114, pl. xiii., f. 22; Tryon, M.C., Vol. IX., p. 380, pl. lxviii., f. 8. Dredged in deep water, P.J.

528 R. FASCIATA, A. Adams, P.Z.S., 1851 ; Tryon, M.C., Vol. IX., p. 380, pl. lxviii., f. 7. Dredged in deep water, P.J.

529 R. CRETACEA, Ten.-Woods, P.L.S., N.S.W., Vol. II., p. 265, Dredged off P.J. Heads, 45 fms., (Brazier).

530 R. CYLINDRACEA, Ten.-Woods, l.c., p. 266. Dredged off P.J. Heads, 45 fms., (Brazier).

531 R. HANLEYI, Schwartz ; Frauenfeld, Reise d. Novara, Band II., Moll., p. 10 ; Tryon, Manual Conch., Vol. IX., p. 370, pl. lv., f. 21. P.J.

532 R. CRASSA, Angas, P.Z.S., 1871, pl. i., f. 16 ; Tryon, M.C., Vol. IX., p. 378, pl. lv., f. 20, pl. lxviii., f. 6. Bottle and Glass Rocks, (Brazier).

533 R. FLEXUOSA, Gould, Otia. Conch. P.J.

534 RISSOIA FRAUENFELDI, Schwartz, Voy. Novara, Moll. Bd. II., p. 10, pl. ii., f. 13 ; Tryon, Man. Conch., Vol. IX., p. 340, pl. 68, f. 86. P.J.

535 R. OLIVACEA, Dunker ; Frauenfeld, Voy. Novara, Moll. p. 11, pl. ii., f. 14 ; Tryon, Man. Conch., Vol. IX., p. 339, pl. lxvi., f. 43. Manly Beach ; Botany Bay ; P.J.

536 R. SALEBROSA, Frauenfeld, Voy. Novara, Moll., p. 11, pl. ii., f. 15 ; Tryon, Man. Conch., Vol. IX., p. 327, pl. lxvi., f. 44. P.J.

537 R. NOVARIENSIS, Frauenf., Voy. Novara, Moll., p. 11, pl. ii., f. 16 ; Tryon, Man. Conch., Vol. IX., p. 329, pl. lxvi., f. 45. P.J., (Brazier).

538 R. FLAMMEA, Frauenf., Voy. Novara, Moll., p. 12, pl. ii., f. 18 ; Tryon, Man. Conch., Vol. IX., p. 339, pl. lxiii., f. 64. Botany Bay.

539 R. INCIDATA, Frauenf., Voy. Novara, Moll., p. 12, pl. ii., f. 19; Tryon, Man. Conch., Vol. IX., p. 339, pl. lxiii., f. 65. Botany Bay.

540 R. CONTABULATA, Frauenf., Voy. Novara, Moll., p. 13, pl. ii., f. 20 a-b; Tryon, Man. Conch., Vol. IX., p. 341, pl. lxix., f. 50, 51. Botany Bay.

541 R. ATROPURPUREA, Frauenf., Voy. Novara, Moll., p. 13, pl. ii., f. 21; Tryon, Man. Conch., Vol. IX., p. 355, pl. lxxi., f. 1. Bondi; Botany Bay; P.J.

542 R. NITENS, Frauenf., Voy. Novara, Moll., p. 13, pl. ii., f. 22; Tryon, Man. Conch., Vol. IX., p. 355, pl. vii., f. 100. Botany Bay.

543 R. ELEGANS, Angas, P.Z.S., 1877, p. 174, pl. xxvi., f. 15; Tryon, M.C., Vol. IX., p. 364, pl. lxvi., f. 46. P.J.,(Brazier).

544 R. GRACILIS, Angas, P.Z.S., 1877, p. 174, pl. xxvi., f. 16; Tryon, M.C., Vol. IX., p. 264, pl. lxvi., f. 47. P.J.,(Brazier).

545 R. SCROBICULATA, Watson, C.R., p. 611, pl. xlvi., f. 4; Tryon, M.C., Vol. IX., p. 339, pl. lxvii., f. 80. P.J., 2-10 fms., ("Challenger.")

546 R. BADIA, Watson, C.R., Vol. xv., p. 612, pl. xlvi., f. 3, pl. lxvii., f. 81; Tryon, M.C., Vol. IX., p. 339, pl. lxvii., f. 81. P.J., 2-10 fms., ("Challenger.")

547 R. AUSTRALIÆ, Frauenf., Reise d. Novara, Moll., p. 14, pl. II., f. 23; Tryon, Man. Conch., Vol. IX., p. 344, pl. lxxi., f. 81. P.J.

Order SCUTIBRANCHIATA.

Sub-Order Podopthalma.

Family NERITIDÆ.

548 NERITA ATRATA, Reeve, Conch. Icon., Vol. IX., pl. iv., f. 16; (non *N. atrata*, Chemn.) = *N. melanotragus*, Smith, Zool. "Alert," p. 69; Tryon, Man. Conch., Vol. x., p. 26, pl. viii., f. 40. Abundant between high and low water-mark, P.J.

549 N. ALBICILLA, Linn.; Quoy & Gaim., Astrolabe, Vol. III., pl. lxv., f. 17-18; Tryon, Man. Conch., Vol. x., p. 19, pl. ii., f. 21-26. Rose Bay, P.J., (Brazier).

550 NERITINA RANGIANA, Recluz, Rev. Zool., 1841, p. 339; Reeve Conch. Icon., Vol. IX., pl. xxxi., f. 142 a-b; Tryon, Man. Conch., Vol. x., p. 55, pl. xviii., f. 89-92. Sow and Pigs Reef, (Brazier).

551 N. SOUVERBIANA, Montrouzier, Jour. de Conch., 1863, Vol. XI., pp. 75-175, pl. v., f. 5; = *N. pulcherrima*, Angas, P. Z.S., 1871, p. 19, pl. i., f. 25. Sow and Pigs Reef, 5 fms., (Brazier).

Family LIOTIIDÆ.

552 Liotia speciosa, Angas, P.Z.S., 1871, p. 19, pl. i., f. 26; Tryon, Man. Conch., Vol. x., p. 110, pl. xxxvi., f. 5, 7, 8. Double Bay, under stones, (Brazier).

553 L. clathrata, Reeve, Conch. Icon., (Delphinula) Vol. i., pl. v., f. 21 a.b; Tryon, Man. Conch., Vol. x., p. 109, pl. xxxvi., f. 95. Sow and Pigs Reef, (Brazier).

554 L. Angasi, Crosse, Jour. de Conch., 1864, p. 343, pl. xiii., f. 4 a; Tryon, Man. Conch., Vol. x., p. 110, pl. xxxvi., f. 4. Dredged in P.J.

555 Cyclostrema Australis, Angas, P.Z.S., 1877, p. 38, pl. v., f. 16; Tryon, Man. Conch., Vol. x., p. 107, pl. xxxv., f. 83-84. In shell sand, Botany Bay, (Brazier).

Family ROTELLIDÆ.

556 Rotella Brazieri, Angas, P.Z.S., 1877, p. 39, pl. v., f. 17. Sow and Pigs Reef, (Brazier).

Family PHASIANELLIDÆ.

557 Phasianella ventricosa, Quoy & Gaim., Astrolabe, Vol. iii., p. 237, pl. lix., f. 8-9; Reeve, Conch. Icon., Vol. xiii., pl. iii.. f. 6 a and b; Tryon, Man. Conch., Vol. x., p. 165, pl. xxxviii., f. 39-43. In shell-sand, Middle Harbour; Long Bay.

558 P. rosea, Angas, P.Z.S., 1867, p. 114, pl. xiii., f. 24; Tryon, Man. Conch., Vol. x., p. 174, pl. xxxix., f. 92. In shell-sand, Coogee Bay.

559 P. virgo, Angas, P.Z.S., 1867, p. 115, pl. xiii., f. 25; Tryon, Man. Conch., Vol. x., p. 181, pl. xxxix., f. 93. In shell-sand, Coogee Bay.

560 P. Kochii, Philippi; Krauss, Moll. Sud. Afric., p. 104, pl. vi., f. 4; Tryon, Man. Conch. Vol. x., p. 170, pl. xxxvii., f. 37-38; Reeve, Conch. Icon., Vol. xiii., pl. v., f. 13 a-b. Dredged in deep water, P.J.

561 P. picturatus, H. & A. Adams, Ann. & Mag. N.H., 3 Ser., Vol. xi., 1863, p. 19; Smith, Zool. "Alert," p. 75, pl. vi., f. C. P.J.

Family TURBINIDÆ.

562 Turbo imperialis, Gmelin; Reeve, Conch. Icon., Vol. iv., pl. ii., f. 6; Tryon, Man. Conch., Vol. x., p. 192, pl. xliii., f. 58, pl lxii.. f. 8. A living specimen obtained amongst the rocks, Watson's Bay, (Dr. J. C. Cox).

563 T. undulata, Chemnitz, Conch. Cab., Vol. x., pl. clxix., f. 1640, 1641; Reeve, Conch. Icon., Vol. iv., pl. i., f. 3; Tryon, Man. Conch., Vol. x., p. 116, pl. xlii., f. 40. Very common, Watson's Bay; Coogee Bay; Botany.

564 T. STRAMINEA, Martyn, Univ. Conch., Vol. I., f. 71 = *T. torquatus*, Gmelin; Reeve, Conch., Icon., Vol. IV., pl. iv., f. 26 a-b; Tryon, Man. Conch., Vol. x., p. 212, pl. xlii., f. 38, pl. xlix., f. 46. Common amongst the rocks at low water, near the Heads.

565 T. EXQUISITUS, Angas, P.Z.S., 1877, p. 175, pl. xxvi., f. 18; Tryon, Man. Conch., Vol. x., p. 107, pl. lxiii., f. 25-26. Cape Solander, Botany Bay, (Brazier).

Family TROCHIDÆ.

566 TROCHUS (MINOLIA) PULCHERRIMA, Angas, P.Z.S., 1869, p. 48, pl. ii., f. 10. P.J.

567 T. DIANTHUS, Fischer, Coq. Viv., p. 392, pl. cxviii., f. 2, = *M. bellula*, Angas, P.Z.S., 1869, p. 48, pl. ii., f. 11. P.J.

568 T. VITILIGINEA, Menke, Moll. Nov. Holl., p. 18. Dredged in Middle Harbour.

569 T. PRODICTUS, Fischer, Coquill Viv., (Trochidæ) p. 395, pl. cxviii., f. 1. P.J.

570 T. APICINA, Gould, Otia. Conch., p. 154. P.J.

571 T. (MONILEA) LENTIGINOSA, A. Adams, P.Z.S., 1851, p. 188, = *M. corrugata*, A. Adams, P.Z.S., 1854, p. 41, (non *T. corrugatus*, Koch) Off South Reef, 8 fms.; Hunter's Bay, Middle Harbour; Cabbage Tree Bay, Manly.

572 T. (GIBBULA) COXI, Angas, P.Z.S., 1867, p. 115, pl. xiii., f. 26. Dredged in P.J.

573 T. SULCOSA, A. Adams, P.Z.S., 1851, p. 186. Middle Harbour; Coogee Bay.

574 T. STRANGEI, A. Adams, P.Z.S., 1851, p. 177. Under stones at low water, P.J.

575 T. PICTURATA, A. Adams & Angas, P.Z.S., 1864, p. 36. On Seaweed, Coogee Bay.

576 T. GLYPTUS, Watson, C.R., Vol. xv., p. 75, pl. vi., f. 8. Station 164 B, 410 fms., ("Challenger.")

577 T. (ZIZYPHINUS) POUPINELI, Souverbie, Jour. de Conch., Vol. XXIII., p. 40, pl. iv., f. 6; Fischer, Coquille Viv., p. 387, pl. cxvi., f. 3, = *Z. comptus*, Adams, P.Z.S., 1854, p. 38 (non *T. comptus*, Phil.) Under stones, Shark Island, (Brazier).

578 T. ARMILLATUS, Wood, Index Test. Suppl., pl. ix., f. 5. Cape Solander, Botany Bay, (Brazier).

579 T. DECORATUS, Philippi, Zeits. fur Malak., 1846, p. 102; Conch. Cab., Band II., pl. xiii., f. 1. P.J.

580 T. (EUTROCHUS) SCITULUS, A. Adams, P.Z.S., 1854, p. 38; Reeve, Conch. Icon., Vol. XIV., p. 6, f. 44. Rose Bay; Watson's Bay; North Harbour.

581 T. (ELENCHUS) APICINUS, Menke, Moll. Nov. Holl., p. 15; Phil., Conch. Cab., p. 133, pl. xxiii., f. 5. Dredged in deep water, P.J.

582 T. EXIGUUS, Gould, Otia. Conch., p. 156. P.J.

583 T. LEUCOSTIGMA, Menke, Moll. Nov. Holl., p. 15; Phil., Conch. Cab., p. 138, pl. xxiii., f. 16. Dredged in deep water, P.J.

584 T. BADIUS, Wood, Index Test., (Ed. Hanley) p. 221, suppl. pl. vi., f. 46. P.J.

585 T. FULIGINENS, A. Adams, P.Z.S., 1851, p. 180; Watson, C.R., Vol. xv., p. 67, pl. iv., f. 11. P.J.

586 T. (CANTHARIDUS) TIBERIANUS, Crosse, Jour. de Conch., 1863, p. 381, pl. xiii., f. 2. On Seaweed, Coogee Bay.

587 T. LINEOLARIS, Gould, Otia. Conch., 157. P.J.

588 T. (BANKIVIA) FASCIATUS, Menke, Syn. Meth. Moll., pp. 51-141 = *B. varians*, Kraus; Phil., Conch. Cab., p. 33, pl. v., f. 1-5. P.J.

589 T. LUGUBRIS, Gould. Otia. Conch., p. 157. P.J.

590 T. (TROCHOCOCHLEA) ZEBRA, Menke; Philippi, Conch. Cab., (Kuster) p. 160, pl. xxvi., f. 4. P.J.

591 T. EXTENUATA, Fischer, Coquille Viv., p. 330, pl. ciii., f. 1; = *Labio porcatus*, A. Adams, P.Z.S., 1851, p. 179, (non *T. porcatus*, Phil.) P.J.

592 T. MULTICARINATA, Chenu., Manuel de Conch, Vol. i., p. 360, f. 2676. P.J.

593 T. STRIOLATUS, Quoy & Gaim., Voy. "Astrolabe," Vol. iii., p. 253, pl. lxiii., f. 18-22, Conch. Cab., p. 58, pl. xxvi., f. 1. P.J., (Brazier); (Quoy & Gaimard).

594 T. (EUCHELUS) BACCATUS, Menke, Moll. Nov. Holl., p. 14; Conch. Cab., p 173, pl. xxvii., f. 13. (*T. aspersus*, Koch.) Common under stones, Watson's Bay.

595 T. SCABRIUSCULUS, Adams & Angas, P.Z.S., 1867, p. 181; Fischer, Coq. Viv., p. 374, pl. cxiv., f. 2. In shell-sand, Middle Harbour.

596 T. (CLANCULUS) MAUGERII, Wood, Index Test. Suppl., p. 220, pl. v., f. 27; Fischer, Coq. Viv., p. 218, pl. lxxii., f. 1. Cabbage Tree Bay; North Head, (Brazier).

597 T. CLANGULUS, Gray; Wood, Index Test. Suppl., p. 17, no. 31, pl. v., f. 31, 1828, (non *C. Clanguloides*, Wood). Frequent under stones, Watson's Bay.

598 T. HOMALOMPHALUS, A. Adams, P.Z.S., 1851, p. 162, no. 44; Fischer, Coq. Viv., p. 235, pl. lxxxi., f. 2. Under stones, Watson's Bay.

599 T. FLORIDUS, Philippi, Conch. Cab, (Kuster) p. 243, no. 309, pl. xxxvi., f. 15. Bottle and Glass Rocks; Sow and Pigs Reef, 5 fms.

600 T. JACUNDUS, Gould, Otia. Conch., p. 156. P.J.

601 T. OCELLATUS, Gould, Otia. Conch., p. 156. P.J.

602 T. NODOLIRATUS, A. Adams, P.Z.S., 1851, p. 163. Shark Bay, P.J.

603 T. (SOLARIELLA) ALBUGO, Watson, C.R., Vol. xv., p. 75, pl. vi., f. 8. P.J., ("Challenger.")

604 AUSTRALIUM TENTORIFORMIS, Jonas; Reeve, Conch. Icon., Vol. XIII., pl. viii., f, 46; Fischer, Coq. Viv., p. 41, pl. xxxi., f. 2, pl. lxxix., f. 2; Tryon, Man. Conch., Vol. x., p. 240, pl. liii,, f. 41, 42. Common at Watson's Bay.

Family STOMATELLIDÆ.

605 STOMATELLA IMBRICATA, Lam., Encycl. Meth., pl. ccccl., f. 2 a-b; Sowerby, Thes. Conch., Vol. II., pl. clxxiv., f. 1. Under stones at low water, Watson's Bay.

606 S. NIGRA, Quoy & Gaim., Voy. "Astrolabe," Vol. III., p. 307, pl. lxvi., f. 10-12; Sowerby, Vol. II., pl. clxxiii, f. 14-16. Common under stones all round P.J.

Family PLEUROTOMARIIDÆ.

607 SCHISMOPE CARINATA, Watson, C.R., Vol. xv., p. 119, pl. viii., f. 6. P.J., 6 – 10 fms., ("Challenger.")

Family HALIOTIDÆ.

608 HALIOTIS NAEVOSA, Martyn, Univ. Conch., pl. xi., f. 63; Phil. Conch. Cab., p. 34, pl. xiv., f. 1-3.

609 H. COCO-RADIATA, Reeve, P.Z.S., 1846, p. 55; Conch. Icon., Vol. III., pl. xiii., f. 46. Under stones, Watson's Bay.

610 H. BRAZIERI, Angas, P.Z.S., 1869, p. 45, pl. ii., f. 1. Watson's Bay, Vaucluse Point.

611 H. ROEI, Gray, Appendix to King's Voy., Vol. II., p. 493, = *H. Hargravesi*, Cox, P.Z.S., 1869, p. 49, pl. xxvi., f. 4; Reeve, Conch. Icon., Vol. III., pl. iv., f. 10. Broken Bay Heads.

612 H. PARVA, Linn.; Reeve, Conch. Icon., Vol. III., pl. xv., f. 53 b. Under a large stone, Bottle and Glass Rocks, (Brazier).

Sub-Order Edriopthalma.

Family FISSURELLIDÆ.

613 FISSURELLA LINEATA, Sowerby, Thes. Conch., Vol. III., pl. ccxli., f. 134-135, = *F. Incei*, Reeve, Conch. Icon., pl. x., f. 69. On rocks, and under stones at low water, P.J.

614 F. CONCATENATA, Crosse & Fischer, Jour. de Conch., 1864, p. 348, pl. iii., f. 4-6. Botany Bay.

615 F. SCUTELLA, Gray, B.M.; Sow., Conch. Ill., f. 34; Thes. Conch., Vol. III., pl. ccxliv., f. 207. Botany Bay.

616 F. NIGRITA, Sow., P.Z.S., 1834, p. 127 ; Thes. Conch., Vol. III., pl. viii., f. 196. P.J.

617 EMARGINULA RUGOSA, Quoy & Gaim., Astrolabe, Vol. III., p. 331, pl. lxviii., f. 17-18, var. ASPERA, Gould, Otia. Conch., p. 12 ; Sow., Thes. Conch., Vol. III., pl. ccxlviii., f. 92, 93, 95, 96-102. P.J.

618 E. STELLATA, A. Adams, 1851, p. 87 ; Sow., Thes. Conch., Vol. III., pl. xiii.. f. 103. Watson's Bay ; Coogee Beach.

619 E. CANDIDA, A. Ad., 1851, p. 85 ; Sow., Thes. Conch., Vol. III., pl. xi., f. 45-46. P.J.

620 E. PARMOPHOIDEA, Quoy & Gaim., Astrolabe, Vol. III., p. 325, pl. lxviii., f. 15-16, = *E. intermedia*, Reeve, Conch. Ill., pl. cxxxix., f. 5-6. P.J.

621 SCUTUS ANATINUS, Donovan in Rees Encyclopedia, Vol. V., Nat. Hist., plates, Conchology, pl. xvi., = *Parmorphorus Australis*, Lam.; Reeve, Conch. Syst., pl. cxxxix., f. 2-3, = *P. convexus*, Quoy & Gaim., Vol. III., p. 322, pl. lxix., f. 5-16. Common under stones, Watson's Bay.

Family PATELLIDÆ.

622 ACMAEA JACKSONIENSIS, Reeve, Conch. Icon., Vol. VIII., pl. xxxix., f. 127 a-b. On the rocks at low water.

623 A. SCABILIRATA, Angas, P.Z.S., 1865, p. 154. Under stones at low water.

624 A. STELLARIS, Quoy & Gaimard, Astrolabe, Vol. III., p. 356, pl. lxxi., f. 1-4. Vaucluse Point.

625 A. SUBUNDULATA, Angas, P.Z.S., 1865, p. 155. On the rocks at low water.

626 A. SEPTIFORMIS, Quoy & Gaim., Astrolabe, Vol. III., p. 362, p. lxxi., f. 43, 44. Coogee ; Bondi.

627 A. CONOIDEA, Quoy & Gaim., Astrolabe, Vol. III., p. 355, pl. lxxi., f. 5-7. Sow and Pigs Reef.

628 A. CINNAMONEA, Gould, Otia. Conch., p. 9. P.J., (Brazier).

629 A. ACULEATA, Reeve, Conch. Icon., Vol. VIII., pl. xxxii., f. 90 a-b, = *A. squamifera*, Reeve, l.c., pl. xxxii., f. 94 a-b. Bondi Bay.

630 A. ALTICOSTATA, Angas, P.Z.S., 1865, p. 56, pl. ii., f. 11. P.J.

631 PATELLA TRAMOSERICA, Martyn, Univ. Conch., Vol. I., pl. xvi. ; Reeve, Conch. Icon., Vol. VIII., pl. xiii., f. 97. Very common on rocks and stones, P.J.

632 P. STELLAEFORMIS, Reeve, Conch. Icon., Vol. VIII., pl. xx., f. 48 a, b, c. Coogee ; Bondi.

Order POLYPLACOPHORA.

Family CHITONIIDÆ.

633 CHITON GLAUCUS, Gray, Spic. Zool., 1830, p. 5 ; = *C. Quoyi*, Deshayes; Reeve, Conch. Icon., Vol. IV., pl. xiii., f. 68. P.J.
634 C. MURICATUS, Adams, P.Z.S., 1852, p. 91. P.J.
635 C. SMARAGDINUS, Angas, P.Z.S., 1867, p. 115, pl. xiii., f. 28. P.J.
636 C. PROTEUS, Reeve, Conch. Icon., Vol. IV., pl. viii., f. 111. Common under stones, P.J.
637 C. JUGOSUS, Gould, Proc. Bost. Soc., N. Hist., Vol. II., p. 142, 1846; U.S. Expl. Exp., Moll., Vol. XII., p. 317, pl. xxviii., f. 430. Camp Cove, P.J.
638 C. USTULATUS, Reeve, Conch. Icon., Vol. IV., pl. xvii., f. 102. Under stones, Watson's Bay.
639 C. CARPENTERI, Angas, P.Z.S., 1867, p. 17, pl. xiii., f. 30. P.J.
640 C. INCEI, Reeve, Conch. Icon., Vol. IV., pl. xvi., f. 94. Watson's Bay.
641 C. RUGULOSUS, Angas, P.Z.S., 1867, p. 115, pl. xiii., f. 29. P.J.
642 C. RUGOSUS, Gray ; Sow., Conch. Ill., f. 49 ; Reeve, Conch. Icon., Vol. IV., pl. xviii., f. 115. P.J.
643 C. PETHOLATUS, Sow., Conch. Ill., f. 65-66 ; Reeve, Conch. Icon., Vol. IV., pl. xiv., f. 74. P.J.
644 C. SCUTIGER, Adams & Reeve, Voy. "Samarang" ; Reeve, Conch. Icon., Vol. IV., pl. xxvii., f. 178. Under stones, Watson's Bay.
645 C. CARINATUS, H. Adams & Angas, P.Z.S., 1864, p. 194. P.J.
646 C. QUERCINUS, Gould, Otia. Conch., p. 3. P.J.
647 C. ANTIQUUS, Reeve, Conch. Icon., Vol. IV., pl. xxv., f. 169. P.J.
648 C. COPPINGERI, Smith, Zool. "Alert," p. 80, pl. vi., f. E. P.J.
649 C. FRUTICOSUS, Gould, Otia. Conch., p. 4. P.J.
650 C. AUSTRALIS, Sowerby, Conch. Ill., f. 46 ; Reeve, Conch. Icon., Vol. IV., pl. ii., f. 10. P.J.
651 C. LONGICYMBA, Blainville ; Sow., Conch. Ill., f. 67 ; Reeve, Conch. Icon., Vol. IV., pl. xxiv., f. 163 a to d. Common at Watson's Bay.
652 C. INCANA, Gould, P. Bost. Soc., N.H., Vol. II., p. 145 ; U.S. Expl. Exp., Moll., p. 315, pl. xxviii., f. 432, 433 a ; Otia. Conch., p. 6. P.J.
653 C. PLATESSA, Gould, Otia. Conch., = *C. versicolor*, Adams, P.Z.S., 1852, p. 92, pl. xvi., f. 5.
654 C. COSTATUS, H. Adams & Angas, P.Z.S., 1864, p. 194; Dall., Bull. U.S. Museum, I., p. 81, f. 40, (dentition). Watson's Bay.
655 C. ANGASI, H. Adams, P.Z.S., 1864, p. 193. P.J.
656 C. VOLVOX, Reeve, Conch. Icon., Vol. IV., 1847, pl. vi., f. 31. Under stones, Middle Harbour ; Watson's Bay.

657 C. Grayi, H. Adams & Angas, P.Z.S., 1864, p. 194. Dredged in Watson's Bay.

658 Chitonellus striatus, Lam.; Sowerby, Conch. Ill., f. 62; Reeve, Conch. Icon., Vol. iv., pl. i., f. 4. Common under stones, P.J.

Order TECTIBRANCHIATA.

Family PHILINIDÆ.

659 Philine Angasi, Crosse, Jour. de Conch., 1865, pl. ii., f. 8. Common on mud banks.

660 Chelidonura Adamsi, Angas, P.Z.S., 1867, p. 116, pl. xiii., f. 32. Found in a rock-pool at low water, Bottle and Glass Rocks, (Brazier).

Family TORNATELLIDÆ.

661 Tornatina Hofmani, Angas, P.Z.S., 1877, p. 39, pl. v., f. 19. Sow and Pigs Reef, (Brazier).

662 T. Brenchleyi, Angas, P.Z.S., 1877, p. 40, pl. v., f. 20. Dredged outside P.J. Heads, 10 fms., (Brazier).

663 T. fusiformis, A. Adams; Sow., Thes. Conch., Vol. iii., p. 570, pl. cxxi., f. 37. Dredged in P.J., 4 fms.

664 T. apicina, Gould, Otia. Conch., p. 113. P.J.

665 Myonia concinna, A. Adams; Sow. Thes. Conch., Vol. ii., p. 172, f. 34. Dredged in P.J.

666 M. speciosa, A. Adams; Sow., Thes. Conch., Vol. ii., pl. clxxii., f. 24, 25. Dredged in Lane Cove River, 3 fms., (Brazier).

667 M. sinuata, Angas, P.Z.S., 1877, p. 39, pl. v., f. 18. Sow and Pigs Reef, (Brazier).

668 Leucotina Esther, Angas, P.Z.S., 1867, p. 116, pl. xiii., f. 31. Deep water, P.J., (Angas).

669 Tornatella coccinatus, Reeve, P.Z.S., 1842, p. 60; Conch. Icon., Vol. xv., pl. i., f. 1 b-c. Inner North Head, 4 fms., (Brazier).

670 T. affinis, A. Adams, P.Z.S., 1854, p. 61, (Solidula). Dredged in P.J.

671 T. niveus, Angas, P.Z.S., 1871, p. 19, pl. i., f. 27. Sow and Pigs Reef, (Brazier).

672 Ringicula caron, Hinds, P.Z.S., 1844; Voy. "Sulphur," p. 47, pl. xvi., f. 15, 16. Off Goat Island, 10 fms., (Brazier).

673 R. denticulata, Gould, Otia. Conch., p. 121. P.J.

674 R. exserta, Hinds, P.Z.S., 1844, p. 97. Dredged near Sow and Pigs Reef, (Brazier).

675 R. arctata, Gould, Otia. Conch., p. 122. Goat Island, P.J., (Brazier).

676 R. AUSTRALIS, Crosse, Jour. de Conch., 1865, p. 44, pl. ii., f. 5. P.J.

677 R. DOLIARIS, Gould ; Watson, C.R., Vol. XV., p. 634, pl. xlvii., f. 8. P.J., 2 – 15 fms.

Family CYLICHNIDÆ.

678 CYLICHNA ELEGAN, Angas, P.Z.S., 1877, p. 175, pl. xxvi., f. 19. Sow and Pigs Reef, (Brazier).

679 C. REGULARIS, Gould, Otia. Conch., p. 113. Sow and Pigs Reef, P.J.

680 C. ARACHIS, Quoy & Gaim., Astrolabe, Vol. II., p. 361, pl. XXVI., f. 28-30. P.J.

681 UTRICULUS (TORNATINA) AVENARIUS, Watson, C.R., Vol. XV., p. 658, pl. xlix., f. 5. P.J.

682 DIAPHANA BRAZIERI, Angas, P.Z.S., 1877, p. 175, pl. xxvi., f. 20. Sow and Pigs Reef, P..J., 4 fms., sandy mud, (Brazier.)

683 AGATHA AUSTRALIS, Angas, P.Z.S., 1871, p. 15, pl. i., f. 9. Dredged near Sow and Pigs Reef, (Brazier).

Family BULLIDÆ.

684 BULLA AUSTRALIS, Gray, Annals of Philosophy, New Series, Vol. IX., p. 408, 1825 ; Quoy & Gaim., Astrolabe, pl. xxvi., f. 38, 39. For synonyms see P.L.S., N.S.W., Vol. x., p. 85, by John Brazier. Sow and Pigs Reef, 2 – 5 fms., (Brazier).

685 B. PUNCTATA, A. Adams, Thes. Conch., p. 577, pl. cxxiii., f. 77. P.J.

686 B. AMPULLA, Linn. ; Reeve, Conch. Icon., Vol. XVI., pl. i., f. 3, = *B. solida*, Gmelin ; Angas, P.Z.S., 1867, p. 226. Middle Harbour.

687 H. TENERA, A. Adams ; Sow., Thes. Conch., p. 583, pl. cxxiv., f. 103. Sand Spit, Middle Harbour, (Brazier).

688 H. CUTICULIFERA, Smith, Ann. & Mag., N.H., 1872, p. 350; Zool. "Alert," p. 87, pl. vi., f. H. Sow and Pigs Reef, P.J.

689 H. CROCATA, Pease, P.Z.S., 1860, p. 432 ; Reeve, Conch. Icon., Vol. XVI., pl. v., f. 29 a-b. P.J.

Family APLUSTRIDÆ.

690 BULLINA LINEATA, Gray, Annals of Philosophy, New Series, Vol. IX., p. 408, 1825 ; Wood, Index Test. Suppl., p. 9, no. 1, pl. iii., f. 1. Rock-pools, Shark Island, (Brazier).

691 B. SCABRA, Chemnitz, Conch. Cab., Vol. x., pl. cxlvi., f. 1352-3. P.J. Heads.

692 HYDATINA PHYSIS, Linn. ; Martini, Conch. Cab., pl. xxi., f. 196-197 ; Reeve, Conch. Icon., Vol. XVI., pl. i., f. 2. Neutral Bay ; Vaucluse Bay.

Family LOPHOCERCIDÆ.

693 Lophocercus delicatulus, G. H. Neville, Jour. Asiatic Soc., Bengal, 1866, Vol. xxxviii., p. 67, pl. xiii., f. 5, (Oxynoe). Sow and Pigs Reef, (Brazier).
694 Askera soluta, Chemnitz, Conch. Cab., Vol. x., pl. xlvi., f. 1359 and 61; Reeve, Conch. Icon., Vol. xvi., pl. i., f. 4 a-b. P.J.
695 A. Fischieri, Adams & Angas, P.Z.S., 1864, p. 37. Lane Cove River, (Brazier).

Family APLYSIIDÆ.

696 Aplysia tigrina, Rang., Hist. Nat. de Aplysiens, pl. xiii. Middle Harbour; Coogee Bay.
697 A. Keraudreni, Rang., Hist. Nat. de Aplysiens, pl. xiii. P.J.
698 A. excavata, Sowerby; Reeve, Conch. Icon., Vol. xvii., pl. iii., f. 8. Bottle and Glass Rocks, (Brazier.)
699 A. hyalina, Sowerby; Reeve, Conch. Icon., Vol. xvii., pl. iv., f. 13. Lane Cove River, (Brazier.)
700 A. Sydneyensis, Sowerby; Reeve, Conch. Icon., Vol. xvii., pl. vii., f. 31. Shark Island, (Brazier).
701 A. Angasi, Sowerby; Reeve, Conch. Icon., Vol. xvii., pl. viii., f. 36. Sow and Pigs Reef, (Brazier).
702 A. Norfolkensis, Sowerby; Reeve, Conch. Icon., Vol. xvii., pl. x., f. 42. Shark Island, (Brazier).
703 Dolabella scapula, Martyn, = *D. Rumphii*, Cuvier; Reeve, Conch. Icon., Vol. xvi., pl. ii., f. 3. Found on sandy mud at low water, Parramatta River.
704 Dolabrifera Brazieri, Sowerby, P.Z.S., 1870, p. 250. Bottle and Glass Rocks, (Brazier).

Family PLEUROBRANCHIDÆ.

705 Pleurobranchus Angasi, Smith, Zool. "Alert," p. 88, pl. vi., f. K, K[1]. P.J.

Family UMBRELLIDÆ.

706 Operculatum aurantium, Pease, American Jour. Conch., Vol. iii., p. 287, = *Umbrella aurantia*. Cabbage Tree Bay; Botany Bay.

Order NUDIBRANCHIATA.

Family DORIDÆ.

707 Doris variabilis, Angas, Journal de Conchyliologie, (Paris) 1864, Vol. xii., p. 44, pl. iv., f. 1. Garden Island, P.J.
708 D. Denisoni, Angas, l.c., p. 45, pl. iv., f. 2. P.J.
709 D. chrysoderma, Angas, l.c., p. 46, pl. iv., f. 3. P.J.

710 D. ARBUTUS, Angas, l.c., p. 47, pl. iv., f. 4. Coogee Bay.
711 D. PANTHERINA, Angas, l.c., p. 47, pl. iv., f. 5. Coogee Bay.
712 D. NODULOSA, Angas, l.c., p. 48, pl. iv., f. 6. Coogee Bay.
713 D. CARNEOLA, Angas, l.c., p. 48, pl. iv., f. 7. P.J.
714 D. OBTUSA, Stimp., P. Acad. N. Sci., Phil., 1855, p. 389, (Vol. VII.) P.J., (Stimpson).
715 D. EXCAVATA, Stimp., l.c., p. 389. P.J., (Stimpson).
716 D. PRAETENERA, Abraham, P.Z.S., 1877, p. 258, pl. xxx., f. 10-12. N.S.W.
717 ACTINODORIS AUSTRALIS, Angas, l.c., p. 49, pl. iv., f. 8. N.S.W.
718 ANGASIELA EDWARDSII, Angas, l.c., p. 49, pl. iv., f. 9.

Family GONIODORIDÆ.

719 CHROMODORIS BENNETTI, Angas, l.c., p. 51, pl. iv., f. 10. P.J.
720 C. LORINGI, Angas, l.c., p. 52, pl. iv., f. 11. Clark Island; Watson's Bay; P.J.
721 C. FESTIVA, Angas, l.c., p. 53, pl. iv., f. 12. Vaucluse.
722 C. DAPHNE, Angas, l.c., p. 54, pl. v., f. 3. P.J.
723 C. CROSSEI, Angas, l.c., p. 54, pl. v., f. 1. P.J.
724 C. SPLENDIDA, Angas, l.c., p. 55, pl. v., f. 2. Watson's Bay, P.J.
725 C. VERRUCOSA, Crosse, l.c., p. 56, pl. v., f. 4. Shark Island, P.J.
726 C. ERINACEUS, Crosse, l.c., p. 57, pl. v., f. 5. Garden Island, P.J.
727 C. OBSCURA, Stimpson, P. Acad. N. Sci., Phil., 1855, p. 388. P.J., (Stimpson).
728 C. RUNCINATA, Bergh., C.R., Vol. x., p. 76, pl. vi., f. 1-4. P.J.

Family POLYCERIDÆ.

729 POLYCERA COOKI, Angas, l.c., p. 58, pl. v., f. 6. Botany Bay.
730 CASELLA ATROMARGINATA, Cuvier, Ann. du Mus., Vol. IV., 1804, p. 473, pl. lxxiv., f. 6.
731 PLOCAMPHORIS IMPERIALIS, Angas, l.c., p. 59, pl. v., f. 7. Vaucluse, P.J.

Family TRIOPIDÆ.

732 TRIOPA YATESI, Angas, l.c., p. 60, pl. v., f. 8. Watson's Bay, P.J.

Family DENDRONOTIDÆ.

733 BORNELLA HERMANNI, Angas, l.c., p. 61, pl. vi., f. 1. Watson's Bay, P.J.

Family MELIBAEIDÆ.

734 Melibaea Australis, Angas, l.c., p. 62, pl. vi., f. 2. Watson's Bay, P.J.

Family PROCTONOTIDÆ.

735 Janus sanguineus, Angas, l.c., p. 63, pl. vi., f. 5. Watson's Bay, P.J.

Family ÆOLIDÆ.

736 Æolis Foulisi, Angas, l.c., p. 64, pl. vi., f. 3. P.J.
737 Æ. Macleayi, Angas, l.c., p. 65, pl. iv. P.J.
738 Æ. cacaotica, Stimpson, Proc. Acad. N. Sci., Phil., 1855, p. 388. P.J., (Stimpson).
739 Flabellina ianthina, Angas, l.c., p. 66, pl. vi., f. 6. Watson's Bay, P.J.
740 F. ornata, Angas, l.c., p. 67, pl. vi., f. 7. P.J.
741 F. Newcombi, Angas, l.c., p. 68, pl. vi., f. 8. Coogee Bay; P.J.

Family ELYSIIDÆ.

742 Elysia Coogeensis, Angas, l.c., p. 69, pl. vi., f. 9. Coogee Bay.
743 E. Australis, Quoy & Gaim., Astrolabe, Vol. II., p. 317, pl. xxiv., f. 18-20. P.J.
744 Glaucus sp. Frequent on the beach at Coogee and Bondi after heavy gales.
745 Rizzolia Australis, Bergh., C.R., Vol. x., p. 27, pl. ix., f.
746 Doridopsis Australiensis, Abrahams, P.Z.S., 1877, p. 263, pl. xxx., f. 25-26. N.S.W.

Sub-Class Pulmonata.

Order BASOMMATOPHORA.

Family AURICULIDÆ.

747 Cassidula zonata, H. Adams & Angas, P.Z.S., 1854, p. 32. Mangrove Swamps, Cook's River, Botany Bay.
748 Marinula patula, Low, Zool. Journal, 1835, Vol. v., p. 289, = *M. xanthostoma*, H. & A. Adams, P.Z.S., 1854, p. 35; Pfeiffer, Mon. Auricul., p. 62. P.J.
749 Ophicardelus Australis, Quoy & Gaim., Astrolabe, Vol. II., pl. xiii., f. 34-38; Pfeiffer, Mongraphia Auriculaceorum, p. 52. Cook's River.
750 O. sulcatus, H. Adams & Angas, P.Z.S., 1854, p. 34; Pfeiffer, Monographia Auriculaceorum, p. 54.
751 O. Quoyi, H. Adams & Angas, P.Z.S., 1854, p. 34; Pfeiffer, Monographia Auriculaceorum, p. 50. P.J.

752 O. IRREGULARIS, Mouss., Jour. de Conch., 1869, p. 64, pl. v., f. 2. P.J.

753 O. MINOR, Mouss., Jour. de Conch., 1869, p. 65, pl. v., f. 3. P.J.; Botany Bay.

Family AMPHIBOLIDÆ.

754 AMPHIBOLA QUOYANA, Potiez & Michaud. Galerie des Mollusques, 1838, p. 288, pl. i.-xxviii., f. 17, 18. Rushcutter's Bay; Cook's River.

755 A. FRAGILIS, Lam.; Quoy & Gaim., Astrolabe, Vol. II., p. 201, pl. XV., f. 10-12. Banks of Parramatta River.

Family SIPHONARIIDÆ.

756 SIPHONARIA SCABRA, Reeve, Conch. Icon., Vol. IX., pl. i., f. 2. P.J.

757 S. DENTICULATA,. Quoy & Gaim., Astrolabe, Vol. II., p. 340, pl. XXV., f. 19, 20. Common on rocks and piles, P.J.

758 S. FUNICULATA, Reeve, Conch. Icon., Vol. IX., pl. ii., f. 6 a-b. P.J.

759 S. BIFURCATA, Reeve, Conch. Icon., Vol. IX., pl. v., f. 22. P.J.

760 S. COCHLEARIFORMIS, Reeve, Conch. Icon., Vol. IX., pl, vi., f. 28. On piles, Watson's Bay.

761 S. ATRA, Quoy & Gaim., Astrolabe, Vol. II., p. 337, pl. XXV., f. 41, 42. Green Point, Watson's Bay, (Brazier).

Family GADINIIDÆ.

762 GADINA CONICA, Angas, P.Z.S., 1867, p. 115, pl. xiii., f. 27. Coogee Bay.

763 G. ANGASI, Dall., Amer. Jour. Conch., Vol. VI., p. 11. Coogee Bay, = *G. pentagoniostoma*, Angas, P.Z.S., 1867, p. 220, (non Sowerby).

Class SCAPHOPODA.

Family DENTALIIDÆ.

764 DENTALIUM LUBRICATUM, Sowerby, Thes. Conch., Vol. III., p. 97, pl. iii., f. 56. Off P.J., 45 fms., (Brazier.)

765 D. ERECTUM, Sowerby, Thes. Conch., Vol. III., pl. xiii., f. 55. Sow and Pigs Reef.

766 CADULUS ACUMINATUS, Deshayes; Angas, P.Z.S., 1871, p. 97. Dredged in Middle Harbour.

PTEROPODA.

Order I. GYMNOSOMATA.

Family NOTOBRANCHÆIDÆ.

767 Notobranchæa inopinata, Pelseneer, C.R., Vol. xix., p. 40, pl. iii., f. 6. Off Sydney Harbour, (Dr. Macdonald).

Family CLIONIDÆ.

768 Clione caudata, Macdonald, Trans. Roy. Soc., Edin., Vol. xxiii., p. 185, pl. ix., f. 3, (non *C. caudata*, Gray). Off Sydney, (Dr. Macdonald).

Order II. THECOSOMATA.

Family I. LIMACINIDÆ.

769 Limacina inflata, d'Orbigny, Voy. dans l'Amerique Meridionale, Vol. v., p. 174, pl. xii., figs. 16-19; Pelseneer, Chall. Report, Vol. xxiii., p. 17. April 3, 1874, between Melbourne and Sydney, ("Challenger.")

770 L. Lesueuri, d'Orb., l.c., p. 171, pl. xii., figs. 12-15; C.R., p. 24. April 3, 1874, between Melbourne and Sydney.

771 L. trochiformis, d'Orb., l.c., p. 177, pl. xii., figs. 29, 31; C.R., p. 29. April 3, 1874, between Melbourne and Sydney.

772 L. bulimoides, d'Orb., l.c., p. 179, pl. xii., figs. 36-38; C.R., p. 30. April 3, 1874, between Melbourne and Sydney; Botany.

Family II. CAVOLINIIDÆ.

773 Clio (Creseis) virgula, Rang, Ann. de Sci. Nat., Ser. i., Vol. xiii., p. 316, pl. xvii., fig. 2; C.R., p. 48. Station 164 A, off Sydney.

774 C. (Creseis) acicula, Rang, l.c., p. 318, pl. xvii., fig. 6; C.R., p. 51. Station 164 A, off Sydney.

775 C. (Hyalocylix) striata, Rang, l.c., p. 315, pl. xv., fig. 7; C.R., p. 54. pl. ii., fig. 3. Off P.J.

776 C. (Styliola) subula, Quoy and Gaimard, Ann. de Sci. Nat., Ser. i., Vol. x., p. 233, pl. viii. d, figs. 1-3; C.R., p. 57. Station 164 A, off Sydney.

777 C. pyramidata, Linne, C.R., p. 63. Figured in Voy. of Bonito, pl. vi., figs. 17-25 (as *Cleodora lanceolata*). Station 164 A, off Sydney.

778 Cuvierina columnella, Rang, l.c., Vol. xii., p. 323, pl. xlv., figs. 1-8; C.R., p. 67. Off P.J.

779 Cavolina trispinosa, Lesueur. Figured by Quoy & Gaimard, Ann. Sci. Nat., Ser. i., Vol. x., p. 231, pl. viii. b, figs. 1-2 as *H. mucronata;* C.R., p. 76. Broken Bay.

780 C quadridentata, Lesueur. Figured as *C. minuta*, by Sowerby in Reeve, Conch. Icon., pl. xx., fig. 9; C.R., p. 78.

781 C. longirostris, Lesueur. Figured in Voy. of Bonito, Vol. ii., p. 152, pl. v., figs. 1-6, as *C. angulata*.

782 C. GLOBULOSA, Rang, MS. Souleyet, Voy. of Bonito, Vol. II., p. 142, pl. iv., figs. 20-24 ; C.R., p. 81. April 3, 1874, between Melbourne and Sydney.
783 C. GIBBOSA, Rang, MS. in d'Orb., Voy. dans l'Amer. Merid., Vol. V., p. 95, pl. v., figs. 16-20 ; C.R., p. 82. Port Jackson, (Angas).
784 C. INFLEXA, Lesueur, Nouv. Bull. Soc., Philom., Vol. III., p. 285, pl. v., fig. 3 ; C.R., p. 85. Port Jackson, (Angas).
785 C. UNCINATA, Rang, MS. in d'Orb., Voy. dans l'Amer. Merid., Vol. V., p. 93, pl. v., figs. 11-15 ; C.R., p. 84.
786 CLEODORA COMPRESSA, Souleyet, Voy. of Bonito, Vol. II., p. 181, pl. vi., figs. 26-32 ; C.R., p. 87. Between Melbourne and Sydney.

Class CEPHALOPODA.

Order I. DIBRANCHIATA.

Sub-Order I. Octopoda.

Family I. OCTOPODIDÆ.

787 OCTOPUS TETRICUS, Gould ; Tryon, Manual of Conchology, Vol. I., p. 121, pl. XXXV., f. 46-47. Near Sydney.
788 O. AUSTRALIS, Hoyle, C.R., Vol. XVI., p. 88, pl. iii., f. 4-5. P.J.
789 O. BOSCII, Lesueur, var. PALLIDA, Hoyle, C.R., p. 81, pl. i., pl. iii., f. 2. Off Twofold Bay.
790 O. PICTUS, Brock, Zeits. fur Wiss. Zool., Band XXXVI., p. 603, pl. xxxvii., f. 3. Littoral ; Middle Harbour ; Watson's Bay.

Family ARGONAUTIDÆ.

791 ARGONAUTA ARGO, Linn. ; Tryon, Manual Conch., p. 138, pl. xlvii., f. 111-115, pl. xlviii., f. 116-119, pl. xlix., f. 120-123. Washed ashore at Manly Beach.
792 A. NODOSA, Solander, Tryon, l.c., p. 140, pl. l., f. 124. Coogee Bay.

Sub-Order II. Decopoda.

Family LOLIGINIDÆ.

793 LOLIGO AUSTRALIS, Gray, Brit. Mus. Cat., p. 71 ; Tryon, l.c., p. 148. P.J.
794 SEPIOTEUTHIS AUSTRALIS, Quoy & Gaimard, Voy. "Astrolabe," Vol. XI., p. 77, pl. iv., f. 1 ; Tryon, l.c., p. 151, pl. lxi., f. 201-205. P.J.

Family SEPIOLIDÆ.

795 SEPIOLA LINEOLATA, Quoy & Gaimard, Voy. "Astrolabe," Vol. II., p. 82, pl. v., f. 8-13 ; Tryon, l.c., p. 157, pl. lxvi., f. 242, pl. lxvii., f. 240, 241, 243. P.J.

796 S. SEPIOLA, Linn ; Tryon, Man. Conch., Vol. I., p. 155, pl. lxv., f. 229, 237, pl. lxvi., f. 229. Iron Stone Cove, P.J., (Brazier).

Family ONYCHOTEUTHIDÆ.

797 ONYCHOTEUTHIS RUTILIS, Gould, Otia. Conch., p. 234 ; Tryon, Man. Conch., Vol. I., p. 169, pl. lxxiv., f. 302. Near Sydney.

Family SEPIIDÆ.

798 SEPIA APAMA, Gray, Brit. Mus. Cat., p. 103, 1849 ; Tryon, l.c., p. 194. Stranded on the beach at Manly.

799 S. CULTRATA, Steenstrup ; Hoyle, C.R., Vol. XVI., p. 133, pl. xx. P.J.

800 S. LATIMANUS, Quoy & Gaimard, Astrolabe, Vol. II., p. 68, pl. ii., f. 2-11 ; Tryon, M.C., Vol. I., p. 192, pl. lxxxviii., f. 400-401. P.J.

801 S. CAPENSE, Orb. ; Tryon, Man. Conch., Vol. I., p. 198, pl. xciv., f. 440-442. P.J.

Family SPIRULIDÆ.

802 SPIRULA PERONII, Lam.; Tryon, l.c., p. 205, pl. xcvi., f. 467-469, pl. cv., f. 585. Coogee ; Bondi ; Botany ; and Middle Harbour.

MOLLUSCOIDEA.

Class I. POLYZOA.

Sub-Class HOLOBRANCHIA, Ray Lankester.

Group A. ECTOPROCTA.

Order GYMNOLAEMATA.

Sub-Order Cheilostomata.

Family ÆTEIDÆ.

1 ÆTEA ANGUINA, Linn. ; Busk, Brit. Mus. Cat., Polyzoa, p. 31, pl. xv., f. 1. Off P.J., ("Challenger.")

2 Æ. DILATATA, Busk, Ann. Mag. Nat. Hist., 2 Ser.. Vol. VII., p. 85, pl. ix., f. 14. On seaweed, Coogee Bay, (W.)

Family EUCRATEIDÆ.

3 SCRUPARIA CHELATA, Linn., Syst. Ed. 10, 816; British Museum Catalogue of Marine Polyzoa, by G. Busk, 1852, p. 29, pl. xvii., f. 2. Littoral, Botany Bay; very common off Ball's Head, P.J., (W.)

4 DIMETOPIA SPICATA, Busk, B.M.C., p. 35, pl. xxix., f. 1. La Perouse, (Brazier); Middle Harbour, (W.)

5 D. CORNUTA, Busk, B.M.C., p. 35, pl. xxix., f. 2-3. Coogee Bay; Botany, (W.)

Family CATENICELLIDÆ.

6 CATENICELLA VENTRICOSA, Busk, B.M.C., p. 7, pl. ii., f. 1-2, pl. iii., f. 1, 2, 3, 4, 5. Very common on the roots of seaweeds, P.J., (W.)

7 C. ALATA, W. Thomson, Dublin, Nat. Hist. Review, 1858. La Perouse, (Brazier); Coogee and Bondi Bays, (W.)

8 C. HASTATA, Busk, B.M.C., p. 7, pl. ii., f. 2-3. La Perouse, (Brazier).

9 C. BUSKII, Wyville Thomson, Nat. Hist. Review, 1858, p. 139, pl. xi., f. 2. Common on *Catenicella ventricosa*, and on the roots of seaweeds, P.J., (W.)

10 C. DELICATULA, Wilson, Trans. Microscopical Society Victoria, Vol. I., p. 65, pl. iv., f. 2. La Perouse, (Brazier).

11 C. ELEGANS, Busk, B.M.C., p. 10, pl. ix., f. 1, 2, 3, 4. Bondi Bay, (W.)

12 C. UMBONATA, Busk, B.M.C., p. 11, pl. x., f. 4-5. Off P.J., ('Challenger.")

13 C. PULCHELLA, Maplestone, Jour. Micro. Soc., Victoria, Vol. I., (1880) p. 64, pl. v., f. 4. 163 B, off P.J.

14 C. PLAGIOSTOMA, Busk, B.M.C., p. 8, pl. v., f. 1-2. Coogee Bay, May 1889, (W.); off P.J., ("Challenger.")

15 C. FORMOSA, Busk, B.M.C., p. 9, pl. vii., f. 1-2. Bondi Bay, (W.)

16 C. MARGARITACEA, Busk, B.M.C., p. 9, pl. vi., f. 1, 2, 3. Coogee Bay, (W.)

Family CALWELLIIDÆ.

17 CALWELLIA GRACILIS, Maplestone; McGill, P.R.S., Vict., 1885, p. 158. Farm Cove, with *avicularia* previously unknown in the genus, (W.)

Family CELLULARIIDÆ.

18 CELLULARIA CUSPIDATA, Busk, B.M.C., p. 19, pl. xxvii., f. 1-2. Shark Island, (Brazier); off P.J., ("Challenger.")

19 SCRUPOCELLARIA SCRUPEA, Busk, B.M.C., p. 24, pl. xxi., f. 1-2. On seaweeds, Middle Harbour, (W.)

20 S. CURVICORNIS, Busk, B.M.C., p. 24, pl. lxii. Watson's Bay, (W.)
21 S. OBTECTA, Haswell, P.L.S., N.S.W., Vol. v., p. 37; McGillivray, Prodromus of the Zoology of Victoria, pl. cxxvi. P.J.
22 CANDA ARACHNOIDES, (Lamx.) Busk, B.M.C, p. 26, pl. xxxiii. La Perouse, (Brazier).
23 CABEREA BORYI, Savigny, Voy. dans l'Egypte, pl. xii., f. 4; Busk, p. 38, pl. xvi., f. 4-5. Bondi Bay, (Brazier).
24 C. ROSTRATA, Busk, Chall. Rep., p. 28, pl. xxxii., f. 4. La Perouse, (Brazier).
25 C. GRANDIS, Hincks, Ann. & Mag. Nat. Hist., Ser. 5, Vol. VIII., p. 2, pl. iii., f. 4, 4 a, 4 b. La Perouse, (J. Brazier).
26 MENIPEA CRYSTALLINA, Gray; Dieffenbach's New Zealand II., 293; Busk, B.M.C., p. 28, pl. xl. Middle Harbour; Coogee Bay, (W.)
27 M. CURVICORNIS, McGillivray, Prod. Zool., Victoria, decade VI., p. 34, pl. lviii. Shark Island, (Brazier).
28 DIDYMIA SIMPLEX, Busk, B.M.C., p. 35, pl. xxxix. Middle Harbour, (W.)
29 NELLIA SIMPLEX, Busk, B.M.C., p. 19, pl. lxv., f. 1. Watson's Bay, (W.)

Family SALICORNARIIDÆ.

30 CELLARIA AUSTRALIS, McGillivray, P.Z., Vict., pl. xlix. Off P.J., ("Challenger.")
31 C. GRANULOSA, Haswell, P.L.S., N.S.W., Vol. v., p. 36. Found in dredgings, P.J.

Family TUBUCELLARIIDÆ.

32 TUBUCELLARIA HIRSUTA, (Lamx.) Busk, Chall. Polyzoa, p. 100, pl. xxxvi., f. 18. Shark Island, P.J., (Hunt).

Family BICELLARIIDÆ.

33 BICELLARIA SP. Common under stones, Middle Harbour,(W.)
34 STIRPARIA? SP. On a sponge, dredged Middle Harbour, (Dr. E. P. Ramsay).
35 BUGULA DENTATA, (Lamx.) Busk, B.M.C., p. 46, pl. xxxv. Off Ball's Head, P.J., (Brazier).
36 B. NERITINA, (Linn.) Busk, Chall. Rep., Vol. x., p. 42. Very common on piles in P.J., the variety with *avicularia* under stones, Watson's Bay, (W.)
37 B. AVICULARIS, (Pallas) Busk, B M.C., p. 45, pl. liii. Under stones, Farm Cove, (W.)
38 BEANIA MAGELLANICA, Busk, B.M.C., p. 54, pl. lxvii. Very common on weeds, stones, &c., Mossman's Bay and many other places, (W.)

39 B. SPINIGERA, McGillivray, Trans. Roy. Soc., Vict., 1859, Vol. III., p. 165 pl. ii., f. 12. Off Green Point, (W.)
40 B. QUADRICORNUTA, Hincks, Ann. & Mag, N.H., Ser. 5, Vol. XV., p. 245, pl. ix., f. 2; Waters, Ann. & Mag. N.H., Ser. 6, July 1889, p. 4. Green Point, P.J., (Brazier).
41 B. HIRSUTISSIMA, var. CONFERTA, McGillivray, Trans. R. Soc., Vict., Vol. XXII., p. 130, pl. i., f. 5; Waters, l.c., p. 4, pl. ii., f. 12-14. Green Point, P.J., (Brazier).

Family FLUSTRIDÆ.

42 FLUSTRA DISSIMILIS, Busk, B.M.C., p. 51, pl. l., f. 4, 5, 6, 7. Bondi Bay, (W.)
43 F. MILITARIS, Waters, Ann. & Mag. Nat. Hist., Ser. 5, Vol. XX., p. 93, pl. iv., f. 2. Frequent between light-ship and Bradley's Head; trawled, (Brazier), (W.)
44 CRASPEDOZOUM ROBERATUM, Hincks, Ann. & Mag. N.H., Ser. 5, 1881, Vol. VIII., p. 128, pl. ii., f. 3. Off Green Point, (W.)

Family FARCIMINARIIDÆ.

45 FARCIMINARIA SP. Off Ball's Head, P.J.
46 VERRUCULARIA DICHOTOMA, Busk, Q. J. Micros. Soc., Ser. 1, p. 155, pl. XXXV., f. 1, 1a, 1861. Common on roots of Laminaria, Watson's Bay; Coogee Bay; Botany, (W.)
47 V. BINDERI, Harvey? Busk, Q. J. Micros. Soc., Ser. 1, 1861, p. 156, pl. XXXV., f. 2, 2a. Sydney, (Harvey?)

Family MEMBRANIPORIIDÆ.

48 ELECTRA PILOSA, (Linn.); McGillivray, P.Z., Vict., p. 106. Middle Harbour; Botany Bay, (W.)
49 E. MULTISPINATA, Hincks, Ann. & Mag. N.H., Ser. 5, Vol. IX., p. 117, pl. v., f. 6. Botany Bay.
50 MEMBRANIPORA NITENS, Hincks, Ann. & Mag. N.H., Ser. 5, Vol. VI., p. 85, pl. xi., f. 4. Common on Laminaria, Bondi Bay; Coogee Bay; Neutral Bay, (W)
51 M. CORBULA, Hincks, Ann. & Mag. N.H., Ser. 5, Vol. VI., p. 378, pl. xvii., f. 6. Sow and Pigs Reef; Bottle and Glass Rocks, (Brazier).
52 M. PYRULA, Ann. & Mag. N.H., Ser. 5, Vol. VII., p. 31, pl. i., f. 2; Waters, Ann. & Mag. N.H., Ser. 6, July 1889, p. 3. Green Point, P.J., (Brazier).
53 M. LEVATA, Hincks, Ann. & Mag. N.H., Ser. 5, Vol. X., p. 467, pl. xix., f. 6, 6a; Waters, l.c., p. 3. Green Point, P.J., (Brazier).
54 M. LINEATA, Linn., var.; Waters, l.c., p. 3, pl. ii., f. 16. Green Point, P.J., (Brazier).

55 M. MEMBRANACEA, Linn.; Busk, B.M.C., p. 56, pl. lxviii. Botany and Coogee Bays, (W.)
56 AMPHIBLESTRUM CURVICORNE, Busk, B.M.C., p. 60, pl. c., f. 3. Under stones, Watson's Bay, (W.)
57 A. SPINOSA, Quoy & Gaimard, Waters, Q. Jour. Geol. Soc., London, Vol. XLIII., p. 48, pl. vii., f. 28. Off Green Point, (W.)
58 A. FLEMINGII, var. MINAX, Busk, Q. J. Micro. Sci., Vol. VIII., p. 125, pl. xxv., f. 1. Sow and Pigs Reef, (Brazier).

Family MICROPORIDÆ.

59 THAIROPORA MAMMILLARIS, Lamx.; Hincks, Ann. & Mag. N.H., Ser. 5, Vol. VI., p. 88, p. x., f. 9.
60 T. ARMATA, McGill., Trans. Roy. Soc., Victoria, 1881, f. 6. On seaweed, P J.
61 DIPLOPORELLA CINCTA, Hutton, Tran. Roy. Soc., Tasm., 1877, p. 23; McGillivray, Trans. Roy. Soc., Victoria, Vol. XVII., p. 1, f. 1. Bondi Bay, (Brazier).
62 MICROPORA PERFORATA, McGill., Prod. Z., Vict., III., p. 29, pl. XXV., f. 2. Sow and Pigs Reef, (Brazier).
63 M. ELONGATA, Hincks, Ann. Mag. N.H., Ser. 5, Vol. VI., p. 380, pl. xvi., f. 4; Waters, Ann. & Mag. N.H., Ser. 6, July 1889, p. 8, pl. i., f. 21-22. Green Point, (Brazier).

Family CRIBRILINIDÆ.

64 CRIBRILINA MONOCEROS, Busk, B.M.C., p. 72, pl. xciii., f. 5-6. Under stones, Watson's Bay, (Brazier); Cabbage Tree Bay, Manly, (W.)
65 C. TUBULIFERA, Hincks, Ann. & Mag. N.H., Ser. 5., Vol. VIII., p. 56, pl. i., f. 7. Off Ball's Head, (Brazier).
66 C. CLITHRIDATA, Waters, Ann. & Mag. Nat. Hist., Ser. 5, Vol. XX., p. 187, pl. v., f. 1, pl. vi., f. 2. Sow and Pigs Reef, 3 – 4 fms., (Brazier).
67 C. RADIATA, Moll.; Hincks, Brit. Mar. Polyzoa, p. 185, pl. XXV., f. 1-9. Green Point.

Family MICROPORELLIDÆ.

68 MICROPORELLA VIOLACEA, Johnstone; Busk, Brit., M. Cat., p. 69, pl. lxxxvii., f. 1-2; pl. cx., f. 1. Bondi Bay, (Brazier).
69 M. CILIATA, Palias; Busk, Brit. M. Cat., p. 73, pl. lxxiv., f. 1-2; pl. lxxvii., f. 3, 4, 5. Sow and Pigs Reef, (Brazier).
70 M. DECORATA, var. LATA, McG., Trans. Roy. Soc., Vict., Vol. XXI., p. 117, pl. iv., f. 5. Off Ball's Head; Watson's Bay, (Brazier).
71 M. MALUSII, Savigny, Busk, Brit. Mus. Cat., p. 83, pl. ciii., f. 1-4. Green Point, (Brazier).

72 M. COSCINOPORA, var. ARMATA, Waters, Quart. Jour. Geological Soc., Vol. XXXVII., p. 331, pl. XV., f. 25 ; Waters, Ann. & Mag. N.H., Ser. 6, July 1889, p. 5, pl. i., f. 1-5. Green Point, (Brazier).

73 ADEONELLOPSIS AUSTRALIS, McG., Trans. Roy. Soc., Victoria, Nov. 1885, pl. ii., f. 2-3. Off Green Point, (W.)

74 A. PARVIPUNCTA, McG., Trans. Roy. Soc., Victoria, Nov. 1885, pl. ii., f. 4. Under stones, Watson's Bay, (W.)

Family ESCHARIDÆ.

SCHIZOPORELLINÆ.

75 SCHIZOPORELLA JACKSONIENSIS, Busk, C.R., Vol. x., p. 164, pl. xix., f. 3. Off P.J., ("Challenger.")

76 S. MARSUPIFERA, Busk, Chall. Rep., Vol. x., p. 165, pl. xxii., f. 14. Bottle and Glass Rocks, (Brazier).

77 S. TRIANGULA, Hincks, Ann. & Mag., N.H., Ser. 5, Vol. VIII., p. 60, pl. ii., f. 4, 4a. Sow and Pigs Reef, 3 – 4 fms., (Brazier).

78 S. AURICULATA, Hincks, British Polyzoa, p. 260, pl. xxix., f. 3-9 ; Waters, Ann. & Mag. N.H., Ser. 6, July 1889, p. 9. Green Point, (Brazier).

79 S. MUCRONATA, Smith, Floridian Bryozoa, p. 45, pl. vii., f. 169; Waters, Ann. & Mag. N.H., Ser. 6, July 1889, p. 10, pl. ii., f. 9. Green Point, (Brazier).

80 S. FILOCINCTA, Reuss ; Waters, Ann. & Mag. N.H., Ser. 6, July 1889, p. 10, pl. i., f. 17-18. Green Point, (Brazier).

81 S. LATA, McG., Tran. Roy. Soc., Vict., Vol. XIX., p. 132, pl. i., f. 7 ; Waters, l.c., p. 10. Green Point, (Brazier).

82 S. SUBIMMERSA, var., Waters, l.c., p. 11, pl. ii., f. 10, 10 a, b, c. Green Point, (Brazier).

83 S. AMBITA, Waters, l.c., p. 11, pl. ii., f. 7. Green Point, (Brazier).

84 S. LAEVIGATA, Waters, l.c., p. 11, pl. ii., f. 8. Green Point, (Brazier).

85 S. SYDNEYENSIS, Waters, l.c., p. 12. Green Point, (Brazier).

86 S. UNISPINOSA, Waters, l.c., p. 15, pl. iii., f. 1-3. Green Point (Brazier).

87 S. TRISPINOSA, Johnstone, var. MUNITA, Hincks ; Waters, l.c., p. 16, pl. iii., f. 12-13, 23. Green Point, (Brazier).

88 S. MALLEOLUS, Hincks, Ann. & Mag. N.H., Ser. 5, Vol. XIII., p. 361, pl. xiii., f. 5 ; Waters, l.c., p. 16, pl. iii., f. 14-15. Green Point, (Brazier).

89 S. NAPIERII, l.c., p. 17, pl. iii., f. 34-35. Green Point (Brazier.)

90 S. PRAESTANS, Hincks, Ann. & Mag., N.H., Ser. 5, Vol. x. Green Point, (Brazier).

91 S. SIGNATA, Waters, l.c., p. 17, pl. iii., f. 4-6. Green Point, (Brazier.)
92 S. OBSTRUCTA, Waters, l.c., p. 18, pl. iii., f. 7-8. Green Point, (Brazier).
93 S. TUBEROSA, (Reuss), Waters, Ann. & Mag. N.H., Vol. xx., Ser. 5, p. 192, pl. vi., f. 9 and 10. Bondi Bay; Botany, (Brazier). Very common on seaweeds all round the coast, (W.)
94 S. RIDLEYI, McG., Trans. Roy. Soc., Vict., Oct. 1882, p. 191, pl. i., f. 1. Off Green Point.
95 S. DIVISOPORA, Waters, Ann. & Mag. N.H., Vol. xx., Ser. 5, p. 193, pl. v., f. 4, pl. vi., f. 4. Off Bottle and Glass Rocks, 8 fms.; Sow and Pigs Reef, 3 – 4 fms., (Brazier).
96 S. CECILLII, Savigny, Egypte, pl. viii., f. 3; Hincks, Brit. Polyzoa, p. 269, pl. liii., f. 6. Very common, Watson's Bay, (W.)
97 S. HYALINA, Linn.; Busk, B.M.C., p. 84, pl. lxxxii., f. 1, 2, 3, pl. ci., f. 1-3 Common on Zosteria, Botany, (W.)
98 S. BISERIALIS, Hincks, Ann. & Mag. N.H., Ser. 5, Vol. xv., p. 250, pl. vii.. f. 3; Waters, Ann. & Mag. N.H., Ser. 6, July 1889, p. 9, pl. ii., f. 11. Green Point, (Brazier).
99 HIPPOTHOA DIVARICATA, Busk, B.M.C., p. 30, pl. xviii., f. 3-4. On old bottles, shells &c., common Neutral Bay, P.J., (W.)
100 GEMMELLIPORA SP. P.J.

LEPRALINÆ.

101 LEPRALIA ELIMATA, Waters, l.c., p. 194, pl. v., f. 3, pl. vi., f. 22. Off Green Point, (Brazier).
102 L. VESTITA, Hincks, Ann. & Mag. N.H., Vol. xv., Ser. 5, p. 256, pl. ix., f. 9, var. AUSTRALIS, Waters, Ann. & Mag. N.H., Ser. 6, July 1889, p. 12, pl. i., f. 19. Green Point, Sow and Pigs Reef, 3 – 4 fms., (Brazier). Both of the above species are common in dredgings, (W.)
103 L. TUBEROSA, Busk, Chall. Rep., Vol. x., pl. xvii., f. 7. Off P.J., "Challenger"; Watson's Bay, (W..
104 L. SETIGERA, Smith; McG., Trans. Roy. Soc., Vict., 1882, pl. i., f. 2. Under stones, Farm Cove; Mossman's Bay, (W.)
105 L. TORQUATA? Quoy & Gaimard, Voy. "Uranie," p. 610, pl. lxxix., f. 7-8. Common on shells and stones at low water Mossman's Bay; Farm Cove and many other places, (W.)
106 L. RECTILINEATA, Hincks, Ann. & Mag. N.H., Ser. 5, Vol. xi., p. 201, pl. vii., f. 5. Green Point, (Brazier).
107 L. DEPRESSA, Busk, Cat. Mar. Polyzoa, Brit. Mus., p. 75, pl. xci., f. 3- 4; Waters, Ann. & Mag. N.H., Ser. 6, July 1889, p. 13, pl. i., f. 13-16. Green Point, (Brazier).

108 L. Poissonii, Aud., var., Waters, l.c., p. 14, pl. ii., f. 17. Green Point, (Brazier).
109 Chorizopora Brogniartii, Savigny, Busk, B.M.C., p. 65, pl. lxxxi., f. 1-5. Off Green Point, (W.)

Mucronellinæ.

110 Porella marsupium, McG., Prod. Zool., Vict., pl. xxxv. Off Green Point, (W.)
111 Smittia Landsborovii, Johnst., form *personata*, Hincks, Ann. & Mag., Ser. 5, Vol. xiv., p. 283, pl. ix., f. 3. Under stones, Watson's Bay, (Brazier).
112 Porina larvalis, McG., Prod. Zool., Vict., iv., p. 30, pl. xxxvii., f. 5. Bondi Bay, (Brazier).
113 P. inversa, Waters, Ann. & Mag. N.H., Vol. xx., Ser. 5, p. 190, pl. iv., f. 23, pl. v., f. 5. Sow and Pigs Reef, 3-4 fms., (Brazier); very common in dredgings off Green Point, (W.)
114 Mucronella Ellerii, McG., var. biaviculata, Waters, l.c., p. 194, pl. v., f. 9. Green Point, (Brazier); var. Vultur, Hincks, Taylor Bay, (W.)
115 Rhynchopora crenulata, Waters, l.c., p. 195, pl. v., f. 7-8. Off Ball's Head, 12 fms., (Brazier).

Family CELLEPORIDÆ.

116 Lekythopora hystrix, McG., Trans. Roy. Soc., Vict., Oct. 1882 and Nov. 1884. Taylor Bay, (W.)
117 Cellepora mamillata, Busk, B.M.C., p. 87, pl. cxx., f. 3-5. Ball's Head, 12 fms.; Watson's Bay, (Brazier).
118 C. bispinata, Busk, B.M.C., p. 87, pl. cxx., f. 1-2. Mouth of Lane Cove River, 7 fms., (Brazier).
119 C. granum, Hincks, Ann. & Mag. N.H., Ser. 5, Vol. viii., p. 127, pl. iii., f. 8. Taylor Bay, (W.); Green Point, (Brazier).
120 C. ovoidea, Savigny, Waters, l.c., p. 199, pl. vi., f. 14-19. Botany Bay, (W.); Vaucluse Point, 5 fms., (Brazier).
121 C. Jacksoniensis, Busk, Chall. Report, Vol. x., pl. xxx., f. 10. Off P.J., ("Challenger.")
122 C. tuberculata, Busk, l.c., pl. xxviii., f. 9. Off P.J., ("Challenger.")
123 C. apiculata, Busk, l.c., pl. xxix., f. 2. Off P.J., "Challenger."
124 C. bidenticulata, Busk, l.c., pl. xxx., f. 6. Off P.J., ("Challenger.")
125 C. albirostris, Smitt; Busk, C.R., Vol. x., p. 193, pl. xxxiv., f. 7, pl. xxxv., f. 3. Shark Island, (Brazier).
126 C. columnaris, Busk, C.R., Vol. x., p. 194, pl. xxix., f. 11, pl. xxxv., f. 16; Waters, Ann. & Mag. N.H., Ser. 6, July 1889, p. 19, pl. ii., f. 1-6. Green Point (Brazier.)

Family RETEPORIDÆ.

127 RETEPORA PHŒNICEA, Busk, B.M.C., p. 94, pl. cxxi., f. 1-2. Off Bottle and Glass Rocks, 8 fms., (Brazier); Green Point, (W.)

128 R. FORMOSA, McG., Prod. Zool., Vict., pl. xcvii., f. 4-6, and pl. xciv., f. 6. Watson's Bay, (W.); Bondi Bay. (Brazier.)

129 R. JACKSONIENSIS, Busk, Chall. Rept., Vol. x., pl. xxvii., f. 4. Off P.J., ("Challenger"; Taylor Bay, (W.)

130 R. FISSA, McG., Tran. Roy. Soc., Vict., Vol. ix., p. 140, and Vol. xix., p. 291, f. 8; Prod. Zool. Vict., decade x., p. 17, pl. xcv., f. 12-16. Green Point, (Brazier).

131 R. PORCELLANA, McG., Prod. Nat. Hist., Vict., decade x., p. 15, pl. xcv., f. 1-6. Green Point, (Brazier).

132 R. PROFUNDA, McGillivray, Tran. Roy. Soc., Vict., Vol. xix. p. 193, pl. ii., f. 8. P.J., (Brazier).

133 R. LONGIROSTRIS, Hincks, Ann. & Mag. N.H., Ser. 5, Vol. viii., p. 125, pl. iv., f. 7-8. Green Point, (Brazier.)

Family SELENARIIDÆ.

134 BIPORA ANGULOPORA, Ten.-Woods, T. P. Soc., Adelaide, 1879-80, p. 5, pl. i., f. 1 a, 1 b, 1 c; Waters, Ann. & Mag. N.H., p. 199; Whitelegge, P.L.S., N.S.W., Vol. xi, 2 Ser. 1887, p. 243. Off P.J., (Brazier).

135 B. ELEGANS, d'Orb; Waters, l.c., p. 200, pl. v., f. 13-17; Whitelegge, l.c., p. 346. Off Green Point, (Brazier); Hunter's Beach, (W.)

136 B. PHILIPPINENSIS, Busk, Brit. M.C., p. 101, pl. cxiii., f. 1, 2, 3; Whitelegge, l.c., p. 341. Off Green Point, (W.)

137 SELENARIA PUNCTATA, Ten.-Woods, Trans. Royal Society, Adelaide, Vol. iii., 1880, p. 9, pl. ii., f. 8. Off Green Point, (W.)

138 LUNULITES PETALOIDES, d'Orb.; Waters, Quart. Jour. Geol. Soc., 1883, p. 442, pl. xii., f. 11 a, b. c. Off Green Point, rare, P.J., (W.)

Sub-Order Cyclostomata.

Family CRISIIDÆ.

139 CRISIA EBURNEA, L. Hincks, Brit. Marine Polyzoa, p. 420, pl. lvi., f. 5-6. Shark Island, P.J., (Brazier).

140 C. EDWARDSIANA, d'Orb.; McGillivray, Prod. Zool. of Vict., decade iv., p. 37, pl. xxxix., f. 1. La Perouse; Botany Bay, (Brazier).

141 C. PUNCTIFERA, Haswell, P L.S., N.S.W., Vol. iv., p. 355. Manly Beach, P.J., (Dr. Haswell).

142 C. INCURVA, Haswell, l.c., p. 335. P.J., (Dr. Haswell).

Family IDMONEIDÆ.

143 IDMONEA RADIANS, Lam.; McGillivray, P.Z., of Victoria, vii., p. 30, pl. lxviii., f. 3. Under stones, Watson's Bay.
144 I. MILNEANA, d'Orb.; Busk, Cat. Cyclostomatous Polyzoa, p. 12, pl. xi. Off Green Point, (Brazier).
145 I. SERPENS, Linn.; Hincks, Brit. Mar. Polyzoa, p. 453, pl. lxi., f. 2-3, pl. lx., f. 2. Off Green Point, (Brazier).
146 I. INTERJUNCTA, McGillivray, Trans. Roy. Soc., Vict. (1885) **Off Green Point, (Brazier).**
147 I. PEDLEYI, Haswell, P.L.S., N.S.W., Vol. IV., p. 351. P.J. (P. Pedley).

Family TUBULIPORIDÆ.

148 TUBULIPORA FIMBRIA, Lam.; Hincks, Brit. Marine Polyzoa, p. 448, pl. lx., f. 3. Bondi Bay, (Brazier).
149 T. PULCHRA, McGillivray, Trans. Roy. Soc., Vict., Vol. XXI., p. 95, pl. ii., f. 1. Vaucluse Point, 5 fms., (Brazier).
150 STOMATOPORA INCRASSATA, Smitt; Hincks, Brit. Mar. Poly., p. 436, pl. lix., f. 2-3. Off Green Point, (Brazier).
151 FASCICULIPORA BELLIS, McGillivray, Trans. Roy. Soc., Vict., Vol. XX., p. 127, pl. i., f. 2. Bottle and Glass Rocks, **(Brazier).**
152 DIASTOPORA LATOMARGINATA, d'Orb.; Waters, Ann. & Mag. N.H., Ser. 3, p. 272, p. xxiv., f. 12. Green Point, (Brazier).
153 MESENTIPORA REPENS, Haswell, P.L.S., N.S.W., Vol. VI., p. 199; Waters, in Ann. & Mag. N.H., Vol. XX., (Ser. 5) p. 260, pl. vii., f. 6-7. Under stones, Watson's Bay, (Brazier).

Family DISCOPORELLIDÆ.

154 DISCOTUBIGERA? LINEATA, McGillivray, Trans. Roy. Soc., Vict., Vol. XXI., p. 96, pl. iii., f. 1. Under stones, Double **Bay, (Brazier).**
155 PUSTULIPORA PROBOSCIDEA, E. Forbes Johnston's British Zoophytes, 2nd Ed., p. 278, pl. xlviii., f. 4-6. Under stones, Cabbage Tree Bay, (Dr. Haswell).
156 P. INTRICARIA, Busk, Cat. Cyclos. Polyzoa, p. 22, pl. x., f. 1-4. P.J., (Dr. Haswell).
157 P. PARASITICA, Busk, l.c., p. 21, pl. xvii., f. 2-2. Parasitic on *Catenicella contricosa*, P.J., (Dr. Haswell).
158 LICHENOPORA NOVÆ-ZELANDIÆ, Busk, Cat. Marine, Polyzoa, pt. iii., p. 32, pl. xxx., f. 2. Bondi Bay, (Brazier); P.J., (Dr. Haswell).
159 L. HOULDSWOSTHII, Busk, l.c., p. 33, pl. xxx., f. 4. Under stones, North side of Watson's Bay, (Brazier).

160 L. GRIGNONENSIS, Busk, Crag. Polyzoa, p. 116, pl. xx., f. 4; Waters, Ann. & Man. N.H., Vol. xx., (5 Ser.) p. 267, pl. vii., f. 1. Off Vaucluse Point, 5 fms., (Brazier); Bondi Bay, (W.)

161 L. CILIATA, Busk, Cat. Cyclost. Polyzoa, pt. iii., p. 31, pl. xxx., f. 6. Common on Fucus, P.J., (Dr. Haswell).

162 L. CALIFORNICA, Busk; Waters, Jour. Linn. Soc., Vol. xxii., p. 282, pl. xv., f. 1. Green Point, (Brazier).

163 L. POROSA, Haswell, P.L.S., N.S.W., Vol. vi., p. 354. P.J., (Dr. Haswell).

164 L. COMPLICATA, Haswell, l.c., p. 354. On Fucus, Clark Island, (Dr. Haswell).

165 L. TRIDENTATA, Haswell, l.c., p. 355. Common on Fucoids, P.J., (Dr. Haswell).

166 L. HISPIDA, Fleming; Hincks, Beit. Mar. Polyzoa, p. 473, pl. lxviii., f. 1-8.

167 L. VICTORIENSIS, Waters, Jour. Linn. Soc., Vol. xxii., p. 284, pl. xv., f. 4. Green Point, (Brazier).

Order CTENOSTOMATA.

Family VESICULARIDÆ.

168 AMATHIA BICORNIS, Tenison-Woods, P.R.S., Victoria, 1880; P.R.S., N.S.W., 1887, p. 84, pl. ii., (as *Serialaria spiralis*). The late Mr. Busk in the Challenger Report, Vol. xvii., p. 34, includes this species with *A. spiralis*, Lamx., with a query. The species are however very distinct. On sea-weed washed ashore at Maroubra Bay, (W.)

169 A. CONVOLUTA, Lamx.' Hist. des Polyp. Flex., p. 160; Ten.-Woods, P.R.S., Vict., 1880. Washed ashore at Maroubra, Bay, (W.)

170 A. SPIRALIS, Lamx., Hist. d. Polyp. Flev., p. 161, pl. iv., f. 2. Clark Island, P.J.

171 A. TORTUOSA, Tenison-Woods, P.R.S, Vict., 1880, Vol. xvi., p. 89 (figure). Very common off Ball's Head,(Dr. Ramsay).

172 A. CORNUTA, Lamx., Hist. d. Polyp. Flex., p. 159, pl. iv., f. 1 a-b. Very common in P.J. and on the outer beaches after gales, (W.)

173 A. SP. This is a very common species, the branches are alternate, the zooecia in clusters of eight pairs, above each cluster there arises a pair of long jointed filaments, each one giving off a short lateral branch. On the beach at Maroubra Bay, (W.)

174 A. WILSONI, Kirkpatrick, Ann. & Mag. N.H., July 1888, Ser. 6, Vol. ii., pl. ii., f. 4, 4a. Frequently washed ashore at Coogee; Bondi, (W.)

175 A. BISERIATA, Krauss, Corallineen und Zoophyten der Sudsee 1837, p. 23, f. 1; Waters, Ann. & Mag. N.H., Ser. 5, Vol. xx., 1887, p. 264, pl. vi., f. 25. Mouth of Lane Cove River; Shark Island, 8 fms., (Brazier); Chowder Bay, (W.)

176 ZOOBOTRYON SP. On piles and rocks at low water Neutral Bay. This species appears to be periodic in its appearance, (W.)

Family CYLINDRŒCIIDÆ.

177 CYLINDRŒCIUM ALTUM? Kirkpatrick, Ann. & Mag. N.H., Ser. 6, Vol. II., 1888, pl. ii., f. 7, 7a. Common under stones, between tide marks Neutral Bay; Middle Harbour, (W.)

178 CRYPTOZOON WILSONI, Dendy, P.R. Vict., 1888, pls. i.-ii. Coogee Bay, on Amathia washed ashore after a very heavy gale, May 1889, (W.)

179 C. CONCRETUM, Dendy, l.c., pls. i.-ii. Attached to the base of a sponge washed ashore at Moroubra Bay, June 1889, (W.)

Group ENTOPROCTA.

Family PEDICELLINIDÆ.

180 PEDICELLINA CERNUA, Pallas; Hincks, Brit. Mar. Polyzoa, p. 565, pl. lxxxi., f. 1-3. Under stones, Farm Cove; Middle Harbour, (W.)

181 ASCOPODARIA FRUTICOSA, Hincks, Ann. & Mag. N.H., 5 Ser., Vol. XIII., p. 364, pl. xiv., f. 3; C.R. Vol. XVII., p. 42, pls. ix.-x. Found among seaweeds on the beach at Maroubra Bay, (W.)

182 LOXOSOMA SP. Attached to *Phascolosoma australis*, P.J. (W.)

Family PHORONIDÆ.

183 PHORONIS AUSTRALIS, Haswell, P.L.S., N.S.W., Vol. VII., p. 606 and 611, also Vol. IX., p. 1019. Common off Ball's Head, 15 fms., associated with an Anemone (*Cerianthus.*)

Class BRACHIOPODA.

ARTHROPOMATA, Owen = CLISTENTERATA, King.

Family TEREBRATULINÆ.

Sub-Family TEREBRATULINÆ.

184 TEREBRATULINA CANCELLATA, Koch.; Dr. T. Davidson, Monograph of Recent Brachiopoda, Trans. Linn. Soc., London, Vol. IV., 2 series, part i., p. 35, pl. vi., figs. 1-8, Old Man's Hat Point, Inner North Head, 7 fms., Sow and Pigs Reef, 3 fms., (Brazier).

185 WALDHEIMIA FLAVESCENS, Lamarck ; Davidson, l.c., p. 41, pl. vii., f. 6-19. Point Piper, Bottle and Glass Rocks, Shark Point, (Brazier); Mossman's Bay, (W.)

Sub-Family TEREBRATELLINÆ.

186 MEGASELLA CUMINGI, Davidson, l.c., pt. ii., p. 97, pl. xvii., figs. 23-22. Sow and Pigs Reef, (Brazier).

Sub-Family MEGERLINÆ.

187 MEGERLIA PULCHELLA, Sowerby, Thes. Conch., Vol. I., p. 360, pl. lxxi., f. 5-6. Off Bottle and Glass Rocks, (Brazier).
188 M. TRUNCATA, Linn.; Dall., American Jour. Conch., 1871, Vol, VI., p. 130. P.J.?

Sub-Family KRAUSSININÆ.

189 KRAUSSINA LAMARCKIANA, Davidson, l.c., pt. ii., p. 124, pl. 21, figs. 7-11. Double Bay, (Brazier) ; Farm Cove, Mossman's Bay, Taylor Bay, (W.)

LYOPOMATA.

Family CRANIIDÆ.

190 CRANIA SUESSII, Reeve, Conch. Icon., pl. i., f. 2 ; Davidson, l.c., pt. iii., p. 192, pl. xxvii., f. 13. Sydney, (Strange).

Family LINGULIDÆ.

191 LINGULA HIANS, Swainson ; Sow., Thes. Conch., Vol. I., p. 338, pl. lxvii., f. 4 ; Davidson, l.c., pt. iii., p. 216, pl. xxix., f. 12-13. Sow and Pigs Reef ; Outer North Head, P.J., (Brazier).

TUNICATA.

Order ASCIDIACEA.

Sub-Order Ascidiæ Simplices.

Family MOLGULIDÆ.

1 MOLGULA FORBESII, Herdman, Chall. Report, Vol. VI., p. 78, pl. v., f. 8-11. Off Shark Point; P.J.
2 M. INCONSPICUA, Stimpson, Proc. Acad. N. Sci., Phil., Vol. VII., 1855, p. 387. P.J.

Family CYNTHIIDÆ.

3 CYNTHIA CEREBRIFORMIS, Herd, l.c., p. 136, pl. xv., f. 5-7, P.J.
4 C. IRREGULARIS, Herd, C.R., p. 141, pl. xvi., f. 13-12. P.J.

5 C. COMPLANATA, Herd, C.R., p. 145, pl. xvii., f. 1-9. Off Ball's Head, P.J.
6 C. LÆVISSIMA, Stimpson, l.c., p. 387. P.J.
7 C. SUBULOSA, Stimpson, l.c., p. 387. P.J.
8 C. DUMOSA, Stimpson, l.c., p. 387. P.J.
9 C. PRÆPUTIALIS, Stimpson, l.c., p. 387. P.J.
10 BOLTENIA PACHYDERMATINA, Herd, C.R., Vol. VI., p. 89, pl. vii., f. 6-8. P.J.
11 B. SPINIFERA? Quoy & Gaim., Voy. "Astrolabe," Vol. III., p. 617, pl. xcii., f. 4. P.J.
12 B. AUSTRALIS, Quoy & Gaimard, Voy. "Astrolabe," Vol. III., p. 615, pl. xcii., f. 2-3. Common on piles in P.J.
13 STYELA GYROSA, Heller, C.R., p. 155. Off Ball's Head, P.J.
14 S. EXIGUA, Herd, C.R., p. 157, pl. xix., f. 5-6. P.J.
15 POLYCARPA TINCTOR, Quoy & Gaim., C.R., p. 170, pl. xxi., f. 16. Shark Island P.J.
16 P. VIRIDIS, Herd, C.R., p. 168, pl. xxi., f. 7-14. P.J.
17 P. LONGISIPHONICA, Herd, l.c., p. 177, pl. xxiii., f. 3-6. P.J.
18 P. RADICATA, Herd, l.c., p. 181, pl. xxiv., f. 3-5. Off Green Point, P.J.

Family ASCIDIIDÆ.

19 ASCIDIA PYRIFORMIS, Herd, l.c., p. 219, pl. xxxiv., f. 1-6. P.J.
20 A. SYDNEIENSIS, Stimpson, l.c., p. 387. P.J.
21 A. SUCCIDA, Stimp., l.c., p. 388. P.J.

Family CLAVELINIDÆ.

22 ECTEINASCIDIA? SP. P.J.
23 CLAVULINA SP. P.J.

Sub-Order II. Ascidiæ Compositæ.

Family BOTRYLLIDÆ.

24 BOTRYLLUS SP. Common under stones, Watson's Bay, (W.)
25 BOTRYLLOIDES SP. On seaweeds, off Green Joint.

Family DIDEMNIDÆ.

26 LEPTOCLINUM JACKSONI, Herdman, Chall. Report, Vol. XIV., p. 303, pl. xxxviii., f. 19-22. P.J.

Family DISTOMIDÆ.

27 COLLELA ELONGATA, Herd., l.c., p. 110, pl. xvi., f. 1-7. Under stones, Coogee Bay, (W.); off Ball's Head and Green Point.
28 C. MURRAYI, Herd., C.R., l.c., p. 115, pl. xvii., f. 1-11. Off P.J.

Family POLYCLINIDÆ.

29 Polyclinum fungosum, Herd., l.c., p. 190, pl. xiv., f. 15-23. Under rock ledges, Middle Harbour, P.J., (W.)

30 Sigillina Australis, Savigny, Mem. Anim. sans Vert., 1816, p. 179, pl. iii., f. 2. Off Ball's Head, P.J.

31 Psammaplidium spongiforme, Herd., l.c., p. 239, pl. xxxii., f. 1-5. Off Green Point, P.J.; Botany Bay.

32 P. sp. On stones at low water, Chowder Bay, (W.)

Sub-Order III. Ascidiæ Salpiformes.

Family PYROSOMIDÆ.

33 Pyrosoma sp. Occasionally washed ashore at Bondi and Coogee, (W.)

Order II. THALIACEA.

Family DOLIOLIDÆ.

34 Doliolum denticulatum, Quoy & Gaim., Zool., "Astrolabe," Vol. iii., p. 599; Herd, C.R., Vol. xxvii., p. 44. Off P.J.

Family SALPIDÆ.

35 Salpa democratica-mucronata, Forsk.; Herd., C.R., Vol. xxvii., p. 79. pl. viii., f. 1-10. Off P.J.

Order III. LARVACEA.

Family APPENDICULARIIDÆ.

36 Appendicularia sp. Frequently obtained in the tow net, P.J.

Part II. Fresh-water Invertebrates.

Sub-Kingdom PROTOZOA.

Class RHIZOPODA.

Order I. PROTOPLASTA.

Sub-Order I. Lobosa.

Amoeba, Ehrenberg.

1 A. proteus, Rösel, Insecten-Belustigung, Nürnberg, 1755, iii., 622, Tab. ci., fig. a-t; Leidy, Fresh-water Rhizopods of North America, p. 30, pl. i., figs. 1-8. Frequent on the leaves of *Lemna*, *Azolla*, and *Utricularia*, Shea's Creek, and near Cook's River in a fresh-water swamp.

2 A. VERRUCOSA, Ehrenberg, Die Infusionsthierchen, 1838 126, Taf. VII., fig. 11 ; Leidy, F. Rhiz. N. Amer., p. 53, pl. iii., figs. 1-38. This species is rather rare. I have seen specimens from only one locality. On *Sphagnum*, Waterloo swamps.

3 A. RADIOSA, Ehrenberg, Infus., 1838, 128, Taf. VII., fig. 13 ; Abh. Ak. Wiss. Berlin, 1830, p. 39 ; Leidy, F. Rhiz. N. Amer., p. 58, pl. iv., figs. 1-18. Abundant in nearly all the localities mentioned in this list.

4 A. VILLOSA, Wallich, Ann. add Mag. Nat. Hist., 1863, XI., p. 287, pl. viii. Very common on dead leaves and decaying vegetable matter. The posterior villi are often hidden from view by the presence of foreign materials such as sand, Desmids, and Diatoms. Shea's Creek, Waterloo Swamps, and near Cook's River.

PELOMYXA, Greeff.

5 P. PALUSTRIS, Greeff, Archiv. für Micros. Anat., 1874, x., p. 51, Taf. III.-v. I found this species in abundance on floating masses of *Oscillatoria*, near Cook's River, and also at Waterloo opposite the end of Elizabeth Street. It attains a very large size, some specimens measuring $\frac{5}{100}$ inch in length, $\frac{3}{100}$ to $\frac{4}{100}$ broad.

DIFFLUGIA, Leclerc.

6 D. GLOBULOSA, Dujardin, Ann. Sc. Nat., 1837, VIII., 311, pl. ix., figs. 1 a-b ; Leidy, F. Rhiz. N. Amer., p. 96, pl. xv., figs. 25-31, pl. xvi., figs. 1-24. Frequent on *Sphagnum* in the Waterloo Swamp, and on *Nitella* in Parramatta Park.

7 D. PYRIFORMIS, Perty, Mittheil. Naturf. Gesells., Bern., 1848, 168 ; Leidy, F. Rhiz. N. Amer., p. 98, pl. x., figs. 1-5. Var. D. COMPRESSA, Carter, Ann. and Mag. Nat. Hist., 1864, XIII., 3rd series, p. 22, pl. i., figs. 5-6 ; Leidy, F. Rhiz. N. Amer., pl. xii., figs. 10-16. Frequent in Waterloo Swamps, Shea's Creek, and in Parramatta Park. Var. D. CORNUTA, Leidy, pl. xxii., fig. 17. Shea's Creek and in an old stone quarry in Moore Park. Var. D. VAS, Leidy, pl. xii., figs. 2-9. Same localities as the last named. The typical form appears to be rare, and I have seen only a few specimens ; other varieties are the most abundant.

8 D. URCEOLATA, Carter, Ann. & Mag. Nat. Hist., 1864, XIII, 3rd series. p. 27, pl. i., fig. 7 ; Leidy, p. 106, pl. xiv., figs. 1, 2, 5, 7, 10. Shea's Creek and Parramatta ; rare.

9 D. CORONA, Wallich, Ann. & Mag. Nat. Hist., 1864, XIII., 3rd series, p. 241, pl. xvi., figs. 19-20 ; Leidy, F. Rhiz. N. Amer., 117, pl. xvii., figs. 1, 2, 5, 6, 9. Waterloo Swamp, Shea's Creek, and Parramatta ; not common.

10 D. ACUMINATA, Ehrenberg, Infus., 1838, 131, Taf. IX., fig. 3; Leidy, F. Rhiz. N. Amer., 109, pl. xiii., figs. 1, 2, 8, 9, 11. Plentiful near Cook's River, Waterloo Swamp, Parramatta Park, and in Duck Creek, Clyde. Forms like figs. 14 and 20, in stone quarry, Moore Park; rare.

ARCELLA, Ehrenberg.

11 A. VULGARIS, Ehr, Abh. Akad Wiss. Berlin, 1830, p. 40, Taf. I., fig. 6; Leidy, 170, pl. xxvii., figs. 1, 2, 3, 11, 12, 25, 26, 27 and 28. Very abundant, almost everywhere, but a very variable species. The numbers of Leidy's figures given above indicate forms similar to those I have observed from different localities. I have seen forms like figs. 8, 9, 10, and 11 on pl. xxviii. in Leidy's book, from Shea's Creek; but such are not common.

12 A. DISCOIDES, Ehr., Monatsb. Ak. Wiss., Berlin, 1843, 139; Leidy, F. Rhiz. N. Amer., 173, figs. 14, 15, 16, 17, 18, 23, 28, 30, 31. This is perhaps the most common of any; it is found associated with *A. vulgaris* and other species in the greatest profusion.

13 A. DENTATA, Ehr., Abh. Akad. Wiss. Berlin, 1830, p. 40; Leidy, F. Rhiz. N. Amer., p. 177, pl. xxx., figs. 10-19. This very beautiful species is rather rare. I have found it only in two localities, in Shea's Creek and Cook's River. In the latter place I found it on *Utricularia;* in the former on the roots of grasses, sedges and floating plants. According to Leidy's figures and description the number of spines is from 9 to 12. The specimens observed by me had from 10 to 15, but their size and general characters are identical with those of European and American examples. The figures given in the "Micrographic Dictionary" and also in Dr. Carpenter's "Microscope and its Revelations," under the name of *A. dentata*, probably represent the var. *angulosa* of *A. vulgaris*.

14 C. ACULEATA, Ehr., Abh. Akad. Wiss. Berlin, 1830, p. 40; Leidy, F. Riz. N. Amer.. 181, pl. xxxi., figs. 1, 3, 4, 12, 14, 23, 24, 27. A very common and variable species both in the character of the materials by which the test is invested, and in the number of spines. Shea's Creek, Waterloo Swamps, Cook's River, and many other places.

COCHLIOPODIUM, Hertwig and Lesser.

15 C. BILIMBOSA, Auerbach, Zeits. Wiss. Zoologie, VII.. 1856, 374, Taf. XIX., figs. 1-13; Leidy, F. Rhiz. N. Amer., 184, pl. xxxii., figs. 1-25. Frequent on *Lemna* and *Azolla* in Shea's Creek, and on *Utricularia* near Cook's River.

Sub-Order II. Filosa.

Euglypha, Dujardin.

16 E. alveolata, Duj., Infusoires, 1841, 252, pl. ii., figs. 9-10; Leidy, 207, pl. xxxv., figs. 2, 3, 6, 11, 12, 13, 14, 15. This is very common and may be obtained in abundance on *Sphagnum*, in the Waterloo Swamps.

Trinema, Dujardin.

17 T. Enchelys, Ehr., Infus., 1838, 132, Taf. ix., fig. 4; Leidy, 226, pl. xxxix. This is a very widely distributed species. It is very abundant near Shea's Creek and in the Waterloo Swamps, near Botany.

Order II. HELIOZOA.

Actinophrys, Ehrenberg.

18 A. sol, Muller, Verm. Terrest. Fluv., 1773, p. 76; Leidy, F. Rhiz. N. Amer., p. 235, pl. lx. Common in nearly all the localities given in this list.

Heterophrys, Archer.

19 Heterophrys sp.? I have on several occasions seen a species closely allied to, if not identical with, one figured by Leidy on pl. xlvi., figs. 7, 8, 9, 13. It existed in a pool of water off Bunnerong Road, which is unfortunately now quite dry. In the same place I found also a colourless gregarious species resembling *Raphidiophrys elegans*, but much smaller and destitute of silicious spicules. The pseudopodia are highly sensitive and the creature retracts them somewhat suddenly if disturbed. It also readily assumes an amœboid form if subjected to pressure. I hope to re-examine both these forms on some future occasion.

Raphidiophrys, Archer.

20 R. elegans, Hertwig and Lesser, Archiv. für Mik. Anat. x., 1874; Leidy, F. Rhiz. N. Amer., 250, pl. xlii., figs. 1-6. This species is not common. I have seen it from two localities only, near Shea's Creek and in the stone quarry Moore Park.

Vampyrella, Cienkowski.

21 V. lateritia, Fresenius, Abh. Senck. Naturf. Gesells. ii., 1856-8, 218, Taf. x., figs. 13-19; Leidy, F. Rhiz. N. Amer., 253, pl. xlv., fig. 10-16. Frequent on *Spirogyra* and other floating Algæ; often free, but usually creeping over the surface of aquatic plants. Localities, Shea's Creek and near Cook's River.

Actinosphaerium, Stein.

22 A. Eichhornii, Ehrenberg, Bericht. Preus. Ak. Wiss., 1840, 198; Leidy, F. Rhiz. N. Amer., p. 259, pl. xli. A very common species, abundant in the Waterloo Swamp and many other places.

Clathrulina, Cienkowski.

23 C. elegans, Cienk., Archiv. für Mik. Anat., iii., 1867, 310, Taf. xviii.; Leidy, F. Rhiz., N. Amer., 273, pl. xliv. This species is very common on *Nitella* and other fine-leaved plants. I have found it in plenty in nearly all the places I have visited in search of aquatic life. Australian specimens appear to be more luxuriant in their growth than European or American examples, the branched or compound state being the most prevalent, whilst the solitary form is rare.

Order III. FORAMINIFERA.

Biomyxa, Leidy.

24 B. vagans, Leidy, F. Rhiz. N. Amer., 281, pls. xlvii., xlviii., figs. 5-12, and in Proc. Ac. Nat. Sc., Phil. 1875, 124. A few months ago this species was fairly abundant in my aquarium. I saw altogether about 20 specimens, many of which I examined with great attention. When first placed on a glass slip it often assumes a spherical shape, and remains motionless for some time. Then all at once it begins to send out pseudopodia from all sides, but ultimately they appear chiefly at the ends of the main body of protoplasm. The ramifications, extreme tenuity, and rapid movement of the pseudopodal processes are really marvellous. It is a difficult matter to trace out the actual termination of the branches, on account of their tenuity and ever changing movements. The whole organism looks like an animated spider's web. I have often noticed rounded masses at some distance from, but connected with, the main body by very slender threads. In these masses there was a continued rotation of the granular protoplasm around a large non-contractile vacuole. The time during which this semi-isolation continued, varied considerably, but in one instance it lasted for over an hour. When the return movement commenced the granular matter was conveyed away first, and afterwards the large vacuole broke up into a number of smaller ones, which moved away in quick succession, and were finally merged into the main protoplasmic body. The vacuoles are very numerous, and move about in all directions with the granular protoplasm. A spherical granular nucleus was seen in several specimens.

INFUSORIA.

Class FLAGELLATA.

Order FLAGELLATA-PENTOSTOMA.

Family CERCOMONADIDÆ.

25 Oikomonas quadratum, S. Kent, Infusoria, Vol. i., p. 254, pl. xiii., f. 71. On Algæ, in the old stone quarry, Moore Park, June 1889.

Family DENDROMONADIDÆ.

26 Anthophysa vegetans, ? Mull. ; Kent, Infusoria, Vol. i., p. 267, pl. xvii., f. 13-26, pl. xviii., f. 1-10. On Myriophyllum in Parramatta Park, August 1886.

27 A. socialis, From. ; S. Kent, Infusoria, Vol. i., p. 372, pl. xvii., f. 9-11. Duck Creek, Clyde ; Parramatta Park near the footbridge, Aug. 1886.

Family SPONGOMONADIDÆ.

28 Rhipidodendron splendidum, Stein. ; S. Kent, Infusoria, Vol. i., p. 285, pl. xvi., f. 1-3. Wooli Creek, Cook's River, rare, August 1886.

29 R. Huxleyi, S. Kent, Infusoria, Vol. i., p. 286, pl. xvi., f. 4-9. Very common on weeds, Waterloo Swamps, June 1889.

30 Spongomonas intestinalis, Cienk ; S. Kent, Infusoria, Vol. i., p. 287, pl. xi., f. 11-14. Duck Creek, Clyde ; Parramatta Park.

31 S. discus, Stein., S. Kent, Infusoria, l.c., p. 287, pl. xi., f. 10. Common on Nitella, Waterloo Swamps.

Order CHOANO-FLAGELLATA.

Several families of this order are represented in our fresh-water fauna, I have met with examples of the following genera *Monosiga*, *Codosiga*, *Astrosiga*, and *Salpingœca*.

Order FLAGELLATA-EUSTOMATA.

Family PARAMONADIDÆ.

32 Menoidium pellucidum, Perty ; Saville Kent, Infusoria, Vol. i., p. 374, pl. xx., f. 15-16. Duck Creek, Clyde.

Family ASTASIADÆ.

33 Astasia trichophora, Ehr. ; S. Kent, Infusoria, Vol. i., p. 376, pl. xx., f. 17-21. Wooli Creek, Cook's River ; Waterloo Swamps.

Family EUGLENIDÆ.

34 Euglena viridis, Ehr. ; S. Kent, Infusoria, Vol. i., p. 381, pl. xx., f. 29-51. Waterloo Swamps ; Wooli Creek.

35 E. spirogyra, Ehr. ; S. Kent, l.c., p. 382, pl. xx., f. 27-28. Wooli Creek, Cook's River.

36 E. oxyuris, Schmarda ; S. Kent, l.c., p. 383, pl. xx., f. 26. Waterloo Swamps.

37 E. acus, Ehr.; S. Kent, l.c., p. 383, pl. xx., f. 24-25. Waterloo Swamps ; Wooli Creek ; Moore Park.

38 Amblyophis viridis, Ehr.; S. Kent, l.c., p. 386, pl. xx., f. 63. Waterloo Swamps.

39 Phacus pleuronectes, Mull. ; S. Kent, l.c., p. 386, pl. xxi., f. 2-5. Waterloo Swamps.

40 P. triqueter, Ehr.; S. Kent, l.c., p. 387, pl. xx.. f. 1. Wooli Creek, amongst clusters of Oscillatoræ.

41 P. longicaudus, Ehr. ; S. Kent, l.c., p. 387, pl. xx., f. 6-7. Waterloo Swamps in Sphagnum pools.

42 Chloropeltis Hispidula, Eichwald ; S. Kent, l.c., p. 388, pl. xx., f. 8-9. Wooli Creek.

43 Trachelomonas volvocina, Ehr. ; S. Kent, l.c., p. 389, pl. xx., f. 14-16. Waterloo Swamps ; Moore Park.

44 T. hispida, Perty ; S. Kent, l.c., p. 389, pl. xx., f. 21-23. Waterloo Swamps ; Horse Pond, Moore Park.

45 T. armata, Ehr.; S. Kent, l.c., p. 390, pl. xx., f. 25. Wooli Creek.

46 Colacium vesiculosum, ? Ehr.; S. Kent, l.c., p. 395, pl. xxi., f. 34-34. Frequent on Entomostraca and on Hydra which is often so covered that at first sight it might be taken for *H. viridis*, being quite green from the number of specimens attached. Waterloo Swamps.

Family CHRYSOMONADIDÆ.

47 Uvella virescens, Ehr.; S. Kent, l.c., p. 406, pl. xxii., f. 25-26. Waterloo Swamps ; Wooli Creek.

48 Dinobryon sertularia, Ehr. ; S. Kent, Vol. i., p. 409, pl. xxii., f. 34-40. Very common in Sphagnum pools, Waterloo Swamps.

49 D. sp. A much larger species than the preceding. In shallow pools, Waterloo Swamps.

50 Synura uvella, Ehr. ; S. Kent, Vol. i., p. 412, pl. xxiii., f. 1-2. Wooli Creek ; Parramatta ; Waterloo Swamps.

Family ANISONEMIDÆ.

51 Anisonema grande, Perty ; S. Kent, l.c., p. 434, pl. xxiv., f. 26-30. Wooli Creek ; Waterloo Swamps,

52 Entosiphon sulcatus, Dujardin ; S. Kent, Vol. i., p. 438, pl. xxiv., f. 31-34. Rare ; Waterloo Swamps.

Order CILIO-FLAGELLATA.

Family PERIDINIIDÆ.

53 PERIDINIUM SP. Wooli Creek, Cook's River.
54 P. TABULATUM, Ehr.; S. Kent, Vol. I., p. 448, pl. XXV., f. 1-5, 55, 57. Waterloo Swamps; Duck Creek.

Class II. CILIATA.

Order HOLOTRICHA.

Family PARAMAECIIDÆ.

55 PARAMAECIUM AURELIA, Mull.; S. Kent, Vol. II., p. 483, pl. XXVI., f. 28-30. Off Bourke Street, Waterloo.

Family PRORODONTIDÆ.

56 NASSULA ORNATA, Ehr.; S. Kent, Vol. II., p. 483, pl. XXVI., f. 28-30. Wooli Creek; Duck Creek.

Family COLEPIDÆ.

57 COLEPS HIRTUS, Ehr.; S. Kent, Infusoria, Vol. II., p. 506, pl. XXVII., f. 3-4. Very common, Wooli Creek; Waterloo Swamps.
58 C. UNCINATUS, Claparede & Lachmann; S. Kent, Vol. II., p. 507, pl. XXVII., f. 6. Wooli Creek.

Family TRACHELIIDÆ.

59 TRACHELIUS OVUM, Ehr.; S. Kent, Infusoria, Vol. II., p. 552, pl. XXVII., f. 38. Very common Waterloo Swamps.
60 AMPHILEPTUS CYGNUS, C. & L.; S. Kent, l.c., Vol. II., p. 524. Moore Park at the back of Mount Rennie, in shallow grassy pools.
61 A. ANSER, Ehr.; S. Kent, l.c., Vol. II., p. 525, pl. XXVII., f. 39-40. Waterloo Swamps.
62 LOXOPHYLLUM MELEAGRIS, Ehr.; S. Kent, l.c., p. 528, pl. XXVII., f. 52.

Order HETEROTRICHA.

Family BURSARIIDÆ.

63 BURSARIA TRUNCATELLA, Muller; S. Kent, l.c., p. 576, pl. XXIX., f. 1-2. In shallow grassy pools, Botany; Waterloo.

Family SPIROSTOMIDÆ.

64 SPIROSTOMUM AMBIGUUM, Ehr.; S. Kent, l.c., p. 586, pl. XXIX., f. 13-14. Wooli Creek, Waterloo Swamps.

Family STENTORIDÆ.

65 STENTOR POLYMORPHUS, Mull.; S. Kent, l.c., p. 590, pl. xxx., f. 10-20. Waterloo Swamps; Duck Creek; Wooli Creek.

66 S. BARRETTI, Barrett; S. Kent, l.c., p. 593, pl. xxx., f. 21. Duck Creek; Parramatta on Myriophyllum.

67 S. IGNEUS, Ehr.; S. Kent, l.c., p. 594, pl. xxx., f. 1-4. Very common in the Horse Pond, Moore Park, on water weeds and stones, which are sometimes completely covered with this beautiful species.

68 S. CÆRULEUS, Ehr.; S. Kent, l.c., p. 593. Waterloo Swamps.

Order PERITRICHA.

Family HALTERIIDÆ.

69 STROMBIUM CLAPAREDI, S. Kent, l.c., p. 634, pl. xxxii., f. 46. Among Conferva, Waterloo Swamps, abundant.

Family GYROCORIDÆ.

70 UROCENTRUM TURBO, Mull.; S. Kent, l.c., p. 641, pl. xxxiii., f. 7-10 Common in stagnant pools, Waterloo Swamps.

Family VORTICELLIDÆ.

71 RHABDOSTYLA SP. Common on *Cyclops australis*, Waterloo Swamps.

72 VORTICELLA NEBULIFERA, Ehr.; S. Kent, l.c., p. 673, pl. xxxiv., f. 20, pl. xxxv., f. 32-34, pl. xlix., f. 1. Common on Myriophyllum, Waterloo Swamps.

73 V. CAMPANULA, Ehr.; S. Kent, l.c, p. 678, pl. xxxiv., f. 36. Horse Pond, Moore Park.

74 V. CHLOROSTIGMA, Ehr.; S. Kent, l.c., p. 686, pl. xlix., f. 33. Horse Pond, Moore Park.

75 V. MONILATA, Tatem; S. Kent, l.c., p. 688, pl. xxxv., f. 27, pl. xlix., f. 39. Duck Creek, Clyde.

76 V. DILATATA, From.; S. Kent, l.c., p. 681, pl. xlix., f. 19. Parramatta,

77 CARCHESIUM POLYPINUM, Linn.; S. Kent, l.c., p. 690, pl. xxxv., f. 30-31, pl. xxxvi., f. 1-8. Off Bourke Street, Waterloo, at the back of the Public School.

78 ZOOTHAMNIUM SP. Waterloo Swamps.

79 EPISTYLIS PLICATILIS, Ehr.; S. Kent, l.c., p. 701, pl. xxxviii., f. 6-8, pl. xxxix., f. 12-15. In Alderson's Dam, Redfern, on grass leaves, 1884.

80 OPERCULARIA NUTANS, Ehr.; S. Kent, l.c., p. 710, pl. xxxix., f. 22-23. Wooli Creek; Waterloo Swamps.

81 O. ARTICULATA, Ehr.; S. Kent, l.c., p. 711, pl. xxxix., f. 24-26.

82 VAGINICOLA CRYSTALLINA, Ehr.; S. Kent, l.c., p. 715, pl. xl., f. 1. On Algæ, Waterloo Swamps.

83 THURICOLA VALVATA, Wright, S. Kent, l.c., p. 718, pl. iv., f. 4-5. On Myriophyllum, Waterloo Swamps.
84 COTHURNIA SP. Duck Creek, Clyde.
85 PYXICOLA FURCIFER, Hutton, Jour. Roy. Micro. Soc., Vol. I., 1878, p. 49, woodcut ; S. Kent, l.c., p. 727. Parramatta Park, on Myriophyllum.

Order HYPOTRICHA.

Family LITONOTIDÆ.

86 LITONOTUS FASCIOLA, Ehr. ; S. Kent, l.c., p. 743, pl. xlii., f. 5-11. Waterloo Swamps.

Family CHLAMYDODONTIDÆ.

87 LOXODES SP. Waterloo Swamps.

Family OXYTRICHIDÆ.

88 STICHOTRICHIA SECUNDA, Perty ; S. Kent, l.c., p. 776, pl. xliv., f. 1-2. Duck Creek, Clyde.
89 OXYTRICHA PLATYSTOMA, Ehr.; S. Kent, l.c., p. 787, pl. xlv., f. 8-9. Wooli Creek.
90 HISTRIO STEINII, Mull. ; S. Kent, l.c., p. 45, f. 13-14. Waterloo Swamps.
91 STYLONYCHIA MYTILUS, Ehr.; S. Kent, l.c., p. 790, pl. xlv., f. 1, and 18-22. Waterloo Swamps.

Family EUPLOTIDÆ.

92 EUPLOTES PATELLA, Ehr.; S. Kent, l.c., p. 798, pl. xliv., f. 23-25. Waterloo Swamps.
93 E. CHARON, Mull. ; S. Kent, l.c., p. 799, pl. xliv., f. 26-29. Duck Creek ; Waterloo Swamps.

Class III. TENTACULIFERA.

Order TENTACULIFERA-SUCTORIA.

Family ACINETIDÆ.

94 PODOPHRYRA FIXA, Mull. ; S. Kent, l.c., p. 813, pl. xlvi., f. 24-30. On Algæ, Waterloo Swamps ; Parramatta.
95 P. ELONGATA, C. & L.; S. Kent, l.c., p. 820, pl. xlviii., f. 21-22. Wooli Creek, Cook's River.
96 P. MOLLIS, S. Kent, l.c., p. 821, pl. xlvi., f. 53-56. Wooli Creek ; Parramatta.
97 P. CYCLOPUM, C. & L.; S. Kent, l.c., p. 819, pl. xlvi., f. 23. On *Cyclops australis*, Waterloo Swamps.

CŒLENTERATA.

PORIFERA.

Order CORNUSPICULÆ.

Family SPONGILLIDÆ.

1 Spongilla sceptroides, Haswell, P.L.S., N.S.W., Vol. vii., p. 209. A green species, abundant in the Water Reserve off Bunnerong Road, (W.)

2 S. sp. Water Reserve, Botany.

3 Tubella nigra, R. v. Lendenfeld, Zool. Jahrbuchern, Band ii., 1887, p. 91, pl. vi., f. 1-5. This species is not naturally black as the name would imply; the specimen described was stained with black mud, the true colour being a dirty yellow. Moore Park, in a pond now filled up; Wooli Creek, Cook's River, (W.)

Order HYDROMEDUSÆ.

Family HYDRIDÆ.

4 Hydra hexactinella, R. v. Lendenfeld, P.L.S., N.S.W., Vol. x., p. 679, pl. xlviii., f. 1-4; Zool. Jahrbuchern, 1887, p. 96, pl. vi., f. 13-14. Shea's Creek; Moore Park; Parramatta, (W.)

Family BLASTOPOLYPIDÆ.

5 Cordylophora Whiteleggei, R. v. Lendenfeld, Zool. Jahrbuchern, 1887, p. 97, pl. vi., f. 11-12. On the roots of Myriophyllum in the river, Parramatta Park near the footbridge, (W.)

Sub-Kingdom VERMES.

PLATYHELMINTHES.

Order TURBELLARIA.

Sub-Order Rhabdocoela.

B. Pharyngea.

Family ACMOSTOMEA.

1 Acomostomum denticulatum, Schmarda, Neue Wirbellose Thiere i., p. 3, pl. i., f. 1, 1a. Cook's River.

Family MESOPHARYNGEA.

2 Mesopharynx diglena, Schmarda, l.c., p. 4, pl. i., f. 12. Sydney and Parramatta.

Family DEROSTOMEA.

3 VORTEX TRIGONOGLENA, Schmarda, l.c., p. 6, pl. i., f. 5. Common in Sphagnum pools, Waterloo Swamps. This is a very pretty greenish coloured species.

4 DEROSTOMUM TRUNCATUM, Schmarda, l.c., p. 6, pl. i., f. 8. Illawarra.

C. APHARYNGEA.

Family GYROSTOMEA.

5 STRONGYLOSTOMUM METOPOGLENUM, Schmarda, l.c., p. 9, pl. ii., f. 21. Sydney.

6 MESOSTOMUM SP. Waterloo Swamps.

E. AGGREGATA.

7 CATENULA BINA, ? Schmarda, l.c., p. 12, pl. ii., f. 29. Bathurst (Schmarda). There is a species of this genus very common in Wooli Creek, Cook's River.

Order TREMATODA.

The larvæ (Cercaria) of species of Distoma are very common in Parramatta Park.

NEMATHELMINTHES.

NEMATODA.

Family GORDIDÆ.

There are at least two species of the genus Gordius found in the Botany Swamps.

Family ANGUILLULIDÆ.

The free-swimming nematoids are common in fresh-water, and the species are numerous.

Class ANNELIDA.

Order OLIGOCHAETA.

Sub-Order Limicolæ.

Family ICHTHYDIIDÆ.

8 CHÆTONOTUS LONGICAUDATUS, Tatem, Q.J. Micro. Sci., 1867, p. 251, pl. x., f. 7. Wooli Creek, Cook's River.

9 C[illegible]LARUS, Mull.; Gosse, Intellectual Observer, Vol. v., p. 393, pl. i., f. 1-3. Waterloo Swamps.

10 C. SQUAMMATUS, Duj.; Gosse, Intellectual Observer, Vol. v., p. 396, pl. i., f. 6. Waterloo Swamps.
11 ICHTHYDIUM sp. Wooli Creek; Waterloo Swamps.

Family NAIDIDÆ.

12 ÆOLOSOMA SP. A very pretty species with salmon coloured globules in the body; very common in the Waterloo Swamps.
13 NAIS SP. Waterloo Swamps and at Wooli Creek.

Family ENCHYTRAEIDÆ.

14 CHAETOGASTER SP. Very common on, and associated with Physa; Waterloo Swamps. For an account of this genus see Trans. Linn. Soc., Vol. XXVI., p. 631, pl. xlviii., xlix.; and Q. Jour. Micro. Sci., 1869, p. 272, both by E. Ray Lankester.

Family NAIDOMORPHA.

15 DERO LATISSIMA, ? Bousfield, Jour. Linn. Soc., Vol. xx., p. 104, pl. xiv., f. 8. On water weeds, Waterloo Swamps.
16 D. SP. This species constructs a tube of sand grains and the empty tests of Arcella and other Rhizopods. The branchiæ consist of four long cylindrical ciliated processes and two which appear to be without cilia, of the same shape but slightly longer. I also saw in one specimen what I took to be a red eye spot on the head but I am not quite certain about it.

Family SAENURIDÆ.

17 TUBIFEX SP. Abundant in Shea's Creek, Waterloo Swamps.

Sub-Class HIRUDINEA.

18 HIRUDO QUINQUESTRIATA, Schmarda, Neue Wirbellose Thiere, p. 2, pl. xvi., f. 140. Wooli Creek, Cook's River. This is the Medicinal Leech of the Sydney Chemists.

ROTIFERA.

Order I. RHIZOTA.

Family FLOSCULARIADÆ.

1 FLOSCULARIA SP. This species closely allied to *F. Coronetta*, Cubitt, but differs from that species in two important characters, i.e., the coronal lobes are equal and triangular in section, whilst those of *F. coronetta* are rounded and unequal. Very common, Moore Park; Clyde, and Parramatta.

2 F. ORNATA, Ehrenberg; Hudson & Gosse, Rotifera, p. 50, pl. i., f. 9; Pritchard, Infusoria, 1861, p. 675, pl. xxxii., f. 384-385, pl. xl., f. 25-26. Near Cook's River; Parramatta on Nitella, Utricularia

3 F. CORNUTA, Dobie, Ann. & Mag. N.H., 2 Ser., Vol. IV., 1849, p. 233, pl. vi.; Hudson & Gosse, Rotifera, p. 51, pl. i., f. 7. Abundant on Utricularia, near Cook's River; Parramatta on Myriophyllum; Waterloo Swamps on Nitella.

4 F. CYCLOPS, Cubitt, Monthly Micro. Jour., Vol. VI., 1871, p. 83, pl. xciii., f. 1-3. I am not quite satisfied as to this species being identical with the British one, it requires further examination; Waterloo Swamps, not common.

5 F. CAMPANULATA, Dobie, Ann. & Mag. Nat. Hist., 2 Ser., Vol. IV., 1849, p. 233, pl. vi.; Hudson & Gosse, p. 52, pl. i., f. 1; Pritchard's Infusoria, p. 675. Waterloo Swamps; Parramatta and near Cook's River; very common on fine leaved water plants.

6 F. AMBIGUA, Hudson, Jour. Roy. Micro. Soc., 2 Ser., Vol. III., 1883, p. 163, pl. iv., f. 1; Hudson & Gosse, Rotifera, p. 53, pl. i., f. 2. On Utricularia near Cook's River, rare.

7 F. SP. This form is allied to *F. algicola*, Hud, and lives like it in clusters of Algæ on Myriophyllum in the river, Parramatta Park.

8 F. MILLSII? I sent short account of this species to Dr. C. T. Hudson, F.R.S., who informs me that it is probably *F. Millsii*, a species which has also been found in Canada, N. America. I have not seen any description, so that there is no reference. Our species closely resembles Stephanoceros and has a short rigid footstalk. In a pond off Bunnerong Road about one mile beyond the Racecourse, also in the water reserve on the Kensington Estate.

9 STEPHANOCEROS EICHHORNII, Ehrenberg; Pritchard, Infusoria p. 661, pl. xxxii., f. 383, pl. xxxvii., f. 1-4; Hudson & Gosse, Rotifera, p. 60, pl. iv., f. 1. I have not found this species, but Mr. G. D. Hirst says that he has seen specimens from a pond in Moore Park.

Family MELICERTADÆ.

10 MELICERTA RINGENS, Schrank; Pritchard, Infusoria, p. 672, pls. xxxii., xxxvi., xxxvii.; Hudson & Gosse, Rotifera, p. 70, pl. v., f. 1. Common on Nitella and other fine leaved plants, Waterloo Swamps.

11 M. CONIFERA, Hudson, Rotifera, p. 72, pl. v., f. 2. Abundant in Duck Creek, Clyde, on Utricularia; in the river, Parramatta Park on Myriophyllum, Dec. 1885.

12 M. JANUS, Hudson, Jour. Roy. Micro. Soc., 2 Ser., Vol. I., 1881, p. 1, pl. i.; Hudson & Gosse, Rotifera, p. 74, pl. vi., f. 1. I found this species in abundance on Myriophyllum in a short arm of Shea's Creek, at the back of the Waterloo Dog Kennels during 1883 and 1884. I have not seen it since although I have repeatedly searched for it.

13 LIMNIAS CERATOPHYLLI, Schrank; Prit., Infusoria, pl. xxxii., f. 388-392, pl. xxxvi., f. 2; Hudson & Gosse, Rotifera, p. 75, pl. vi., f. 1. Moore Park in an old stone quarry; off Bourke Street opposite Forsyth's Rope Works; Parramatta Park, very common.

14 L. ANNULATUS, Bailey; Cubitt, Monthly Micro. Jour., Vol. VI., 1871, p. 165, pl. xcviii.; Hudson & Gosse, Rotifera, p. 77, pl. vi., f. 2. Near Cook's River on Utricularia, rare.

15 CEPHALOSIPHON LIMNIAS, Ehr.; Hudson & Grosse, Rotifera, p. 77, pl. vi, f. 3. Moore Park, opposite the end of Cleveland Street, (pond now filled up); Waterloo Swamps frequent.

16 ŒCISTES CRYSTALLINUS, Ehr.; Hudson & Gosse, Rotifera, p. 80, pl. vii., f. 3. Moore Park; Water Reserve off Bunerong Road; Parramatta Park, very common.

17 Œ. INTERMEDIUS, Davis, Trans. Roy. Micr. Soc., Vol. xv., 1867, p. 14, pl. i., f. 1-4. On Chara in a waterhole between Clyde and Granville near the railway on the left hand side going from Sydney.

18 Œ. LONGICORNIS, Davis; Hudson & Gosse Rotifera, p. 82, pl. vii., f. 6. On Myriophyllum Parramatta Park; Waterloo Swamps, frequent.

19 Œ. PILULA, Wills; Hudson & Gosse, Rotifera, p. 82, pl. vii., f. 2. Water Reserve, off Bunnerong Road, rare.

20 Œ. SP. I found this species on Nitella in brackish water at Cook's River, it somewhat resembles *Œ. intermedius.*

21 Œ. SP. This species possesses a tube like that of *Œ. longicornis,* but it is larger and the upper portion is pliable and is drawn in at the apex when the Rotifer retires in its tube so that it acts like a valve and effectually closes the aperture.

22 Œ. SP. This species lives as a commensal in clusters of Algæ on Myriophyllum in the river, Parramatta Park; it resembles *Œ. crystallinus*, but is much smaller and the foot is longer in proportion to its size.

23 Œ. PTYGURA, Ehr.; Hudson & Gosse, Rotifera, p. 81 and p. 134, pl. xxx., f. 3. I found this species inhabiting the empty tubes of *Œ. intermedius*, in the waterhole between Clyde and Granville. I also saw some attached to Chara without any trace of tube.

24 LACINULARIA SOCIALIS, Ehrenberg, Die Infus., 1838, p. 403, pl. xliv., f. 4 ; Huxley, Trans. Micr. Soc., Vol. I., new series, 1853, p. 1, pl. i., pl. xi., f. 20-25 ; Pritchard, Infusoria, p. 671, pl. xxxvii., f. 19-25 ; Hudson & Gosse, Rotifera, p. 85, pl. viii., f. 1. Common on weeds in the river, Parramatta Park, and in creeks and waterholes beyond the park near the Lunatic Asylum.

25 L. PEDUNCULATA. This is a fine new species which may possibly form the type of a new genus when fully investigated. It forms social clusters nearly $\frac{1}{4}$ of inch in diameter the clusters are situated on the end of a long peduncle or stalk which is as long or slightly longer than the diameter of the cluster. The foot of each rotifer is drawn out into a fine filament, the united filaments forming the peduncle. Attached to the leaves and stems of Myriophyllum in a waterhole behind Mount Steel, Moore Park about 50 yards past the spot where some boring for coal took place some years ago ; also in the water reserve off Bunnerong Road on the right hand side going towards Waterloo Swamps. I have only seen this species on two occasions; it appears to live in shallow grassy pools, and only lives for a short time. October 1883, August 1887.

Order II. BDELLOIDA.

Family PHILODINADÆ.

26 PHILODINA CITRINA, Ehr. ; Hudson & Gosse, Rotifera, p. 101, pl. ix., f. 6. In a rock-pool Moore Park behind the Shooting Butts.

27 P. ACULEATA, Ehr.; Hudson & Gosse, Rotifera, Vol. I., p. 101, pl. ix., f. 5. The specimens seen by me had the spines placed in the position given in the plate referred to. Waterloo Swamps, June 1889.

28 P. ROSEOLA, Ehr.; Hudson & Gosse, Rotifera, p. 99, pl. ix., f. 4. In a rock-pool overlooking the sea at Coogee.

29 ROTIFER MACROCEROS, Gosse, Ann. & Mag. Nat. Hist., 2nd Ser., Vol. VIII., 1851, p. 202 ; Hudson & Gosse, Rotifera, p. 105, pl. x., f. 5. Clyde ; Parramatta.

30 R. SP. This is a species which I have only met with once, it is rather larger than the preceding species and attaches itself to weeds ; the eggs of this form are stalked and fastened to the stems of plants like those of Corixa (an aquatic insect) which they resemble in shape. In Duck Creek, Clyde, and Wooli Creek near Cook's River.

31 R. VULGARIS, Schrank ; Hudson & Gosse, Rotifera, p. 104, pl. x., f. 2. Moore Park ; Waterloo Swamps and many other places.

32 ACTINURUS NEPTUNIUS, Ehr. ; Hudson & Gosse, Rotifera, p. 108, pl. x., f. 6 ; Pritchard, Infusoria, p. 704, pl. xxxv., f. f. 481-4. Waterloo Swamps ; Wooli Creek, Cook's River.

Order III. PLOÏMA.

Sub-Order II-loricata.

Family MICROCODIDÆ.

33 MICROCODON CLAVUS, Ehr.; Hudson & Gosse, Rotifera, p. 118, pl. xi., f. 1 ; Pritchard, Infusoria, p. 665, pl. xxxii., f. 371-2. In shallow waterholes behind Mount Steel, Moore Park ; rare, Nov. 18, 1886.

Family ASPLANCHNADÆ.

34 ASPLANCHNA EBBESBORNII, Hudson, Jour. Roy. Micro. Soc., 2 ser., Vol. III., 1883, p. 621, pl. ix.-x. ; H. & G., Rotifera, p. 120, pl. xi, f. 3. Abundant in the large dam near the end of Elizabeth Street, South, Nov. 3, 1886.

35 A. BRIGHTWELLII, Gosse, Ann. & Mag. N.H., 2 Ser., Vol. VI., 1850, p. 23; H. & G., Rotifera, p. 122, pl. xii., f. 1. In the same locality as the preceding, Nov. 3, 1886.

36 A. SP. In an old stone quarry, Moore Park, behind the Cricket Ground, Oct. 1883, Nov. 1887. It is possible this may be *A. priodonta*, Gosse.

37 A. MYRMELEO, Ehr. ; Pritchard, Infusoria, p. 682, pl. xxxiii., f. 418. This species feeds on Entomostraca. Botany Swamps ; and in the dam at the end of Elizabeth Street, very abundant, Aug. to Nov. 1886.

38 SACCULUS VIRIDIS, Gosse, Ann. & Mag. N.H., 2 Ser. Vol. VIII., 1851, p. 198 ; Hudson & Gosse, Rotifera, p. 124, pl. xi., f. 2. In boggy pools amongst bog-moss (Sphagnum) Waterloo Swamps, about a quarter of a mile from the end of Elizabeth Street and close to a small creek, Aug. 1, 1886.

Family SYNCHAETADÆ.

39 SYNCHAETA TREMULA, Ehr. ; Pritchard, Infusoria p. 686 ; Hudson & Gosse, Rotifera, p. 128, pl. xiii., f. 2. In the same locality as the preceding, Nov. 1886.

Family TRIARTHADÆ.

40 POLYARTHRA PLATYPTERA, Ehr.; Hudson & Gosse, Rotifera, Vol. II., p. 3, pl. xiii., f. 5. Waterloo Swamps ; Botany ; Parramatta ; common, Aug. to Nov., 1886.

41 TRIARTHRA LONGISETA, Ehr.; Hudson & Gosse, Rotifera, Vol. II., p. 6, pl. xiii., f. 6. Parramatta Park; Waterloo Swamps very common, Aug. 24, 1886.

Family HYDATINADÆ.

42 HYDATINA SENTA, Ehr.; Hudson & Gosse, Rotifera, Vol. II., p. 9, pl. xiv., f. 1. In shallow pools corner of Bourke Street and Botany Road; off Botany Road in swampy ground near the water-works, August 28, 1886.

43 H.? SP. A very common species having a great resemblance to *H. senta*, but smaller and the corona is very different in structure. Moore Park and many other places.

Family NOTOMMATADÆ.

44 TAPHROCAMPA ANNULOSA, Gosse, Ann. & Mag. N.H., 2 Ser., 1851, p. 199; Hudson & Gosse, Rotifera, Vol. II., p. 16, pl. xvii., f. 12. Moore Park; Waterloo Swamps; and Wooli Creek.

45 T. SELENURA,? Gosse, Jour. Roy. Micro. Soc., 1887, p. 1, pl. i., f. 1. Waterloo Swamps, rare.

46 TRIOPHTHALMUS DORSUALIS, Ehr.; Eckstein, Zeitschrift fur Wissensch., Zoologie, Band XXXIX., 1883, p. 368, pl. XXV., f. 31. I am not sure as to our species being the same as Ehrenberg's, as there is some slight difference in the position of the lateral cervical eyes. In Eckstein's figure they are represented as being slightly in advance of the central eye, whilst in our species they are a considerable distance behind and placed nearer together than those figured by Eckstein. In Sphagnum pools Waterloo Swamps about a quarter of a mile from, but opposite the end of Elizabeth Street South, July 1886.

47 NOTOMMATA AURITA, Ehr.; Hudson & Gosse, Rotifera, Vol. II., p. 21, pl. xvii., f. 6; Eckstein, Zeits. fur Wissen., Zoologie, Band XXXIX., 1883, p. 360, pl. XXV., figs. 23-27. In a note in "The Rotifera," Vol. II., p. 21, Mr. Gosse states that neither himself, Dr. Hudson, nor Dr. Plate had ever seen the frontal eyes as described and figured by Eckstein. I may say that I have seen them often in what I take to be *N. aurita*, there is no difficulty in observing them, they are very conspicuous and at once strike the eye of the observer when the specimen is seen from the dorsal surface. Common at Botany, and in the same locality as the preceding species. July 1886.

48 N. TRIPUS, Ehrenberg; Hudson & Gosse, Rotifera, Vol. II., p 22, pl. xvii., f. 4. Moore Park, in the old stone quarry.

49 N. PILIARIUS, Gosse, Rotifera, Vol. II., p. 23, pl. xvii., f. 5. In the same place as the preceding. July 1886.

50 N. LACINULATA, Ehr. ; Hudson & Gosse., Vol. II., p. 26, pl. XVII., f 9. In a pool in the Botanical Gardens.

51 N. COLLARIS, Ehr.; Hudson & Gosse, Rotifera, Vol. II., p. 27, pl. XVI., f. 6. In Sphagnum pools, Waterloo Swamps, Aug. 1886.

52 N. WERNECKII, Ehr.; Pritchard, Infusoria, p. 683. In the tubes of an Algæ (Vaucheria sp.), Moore Park behind Mount Steel.

53 N. FORCIPATA, Ehr. ; Hudson & Gosse, Rotifera, Vol. II., p. 23, pl. XVIII., f. 1. Sphagnum pools, Waterloo Swamps.

54 N. CYRTOPUS, Gosse, Rotifera, Vol. II., p. 22, pl. XVII., f. 7. Waterloo Swamps, June 1889.

55 COPEUS LABIATUS, Gosse, Rotifera, Vol. II., p. 28, pl. XVI., f. 1. In a short arm of Shea's Creek, Waterloo Swamps, rare.

56 C. SPICATUS, Hudson, Jour. Roy. Micro. Soc., 2 Ser., Vol. V., 1885, p. 612, pl. XII., f. 5 ; Hudson & Gosse, Rotifera, Vol. II., p. 29, pl. XVI., f. 2, In Sphagnum pools, Waterloo Swamps, rare.

57 C. PACHYURUS, Gosse, Rotifera, Vol. II., p. 31, pl. XVI., f. 4. In pools off Bumerong Road, at the back of the Race Course, July 1886.

58 C. CAUDATUS, Collins ; Hudson & Gosse, Rotifera, Vol. II., p. 33, pl. XVI., f. 5. Duck Creek, Clyde; Parramatta and Waterloo Swamps.

59 C. CERBERUS, Gosse, Rotifera, Vol. II., p. 34, pl. XVI., f. 3. Botanical Gardens, July 1886.

60 PROALES FELIS, Ehr. ; Hudson & Gosse, Rotifera, Vol. II., p. 36, pl. XVIII., f. 17. Shea's Creek ; Waterloo Swamps, July 1886.

61 P. PETROMYZON, Ehr.; Hudson & Gosse. Rotifera, Vol. II., p. 36, pl. XIII., f. 9. In Sphagnum pools, Waterloo Swamps, July 1886.

62 P. PARASITA, Ehr.; Hudson & Gosse, Rotifera, Vol. II., p. 39, pl. XVIII., f. 11. Botany, near the Water-works, parasitical in Volvox, Aug. 1886.

63 FURCULARIA FORFICULA, Ehr. ; Hudson & Gosse, Rotifera, Vol. II., p. 41, pl. XX., f. 1. Moore Park, in rock pools, July 1886.

64 F. ENSIFERA, Gosse, Rotifera, Vol. II., p. 43, pl. XX., f. 3. In Sphagnum pools, Waterloo Swamps.

65 F. LONGISETA, Ehr.; Hudson & Gosse, Rotifera, Vol. II., p. 46, pl. XVIII., f. 16. In Shea's Creek at the back of Forsyth's Rope Works.

66 EOSPORA SP. I have only seen a few examples of this species and at the time I was unable to identify them. Botanical Gardens ; Moore Park, July 1886.

67 DIGLENA FORCIPATA, Ehr.; H. & G., Rotifera, Vol. II., p. 50, pl. xix., f. 2. In Sphagnum pools, Waterloo Swamps, Aug. 1886.
68 D. CATELLINA, Ehr. ; Hudson & Gosse, Vol. II., p. 58, pl. xix., f. 10. Waterloo Swamps, June 1889.

Sub-order Loricata.

Family RATTULIDÆ.

69 MASTIGOCERCA CARINATA, Ehr. ; Hudson & Gosse, Rotifera, Vol. II., p. 60, pl. xx., f. 7. Parramatta Park ; Wooli Creek, Cook's River.
70 M. ELONGATA, Gosse, Rotifera, Vol. II., p. 62, pl. xxi., f. 8. Botany Swamps, Aug. 1886.
71 M. BICORNIS, Ehr.; H. & G., Rotifera, Vol. II., p. 63. pl. xx., f. 5. Duck Creek, Clyde, April 1886.
72 RATTULIS TIGRIS, Müller ; H. & G., Rotifera, Vol. II., p. 65, pl. xx., f. 13. Botanical Gardens.
73 R. SEJUNCTIPES, Gosse, Rotifera, Vol. II., p. 66, pl. xx., f. 15. Pool behind Mount Steel, Moore Park.
74 CŒLOPUS TENUIOR, Gosse, Rotifera, Vol. II., p. 68, pl. xx., f. 19. In Sphagnum pools, Waterloo Swamps.
75 C. PORCELLUS, Gosse, Rotifera, Vol. II., p. 67, pl. xx., f. 18. Waterloo Swamps, June 1889.
76 C. BRACHYURUS, Gosse, Rotifera, Vol. II., p. 69, pl. xx., f. 21. Waterloo Swamps, June 1889.

Family DINOCHARIDÆ.

77 DINOCHARIS POCILLUM, Ehr.; H. & G., Rotifera, Vol. II., p. 71, pl. xxi., f. 1. Moore Park ; Waterloo Swamps ; Botanical Gardens, very common.
78 D. TETRACTIS, Ehr.; H. & G., Rotifera, Vol. II., p. 22, pl. xxi., f. 2. Rock pool, Moore Park, Aug. 1886.
79 D. SP. This is probably a new species, it differs from *D. Collinsii* and from *Polychaetus subquadratus* Perty, in the contour of the body and in the number of spines. I have only seen two examples under very unfavourable conditions and my drawings of the species are very imperfect as to details. Wooli Creek, near Cook's River ; Botany Bay.
80 D. TRUNCATUM, N. Sp. This species is very common and may be distinguished from *D. tetractis* by the much wider lorica, absence of transverse ridges, the abruptly truncated posterior end of the body, and the spineless foot. Botanical Gardens ; Waterloo Swamps, June and July 1889.
81 SCARIDIUM LONGICAUDUM, Ehr.; H. & G., Rotifera, Vol. II., p. 73, pl, xxi., f. 5. Shea's Creek ; Sphagnum pools, Waterloo Swamps.

82 Stephanops muticus, Ehr.; H. & G., Rotifera, Vol. II., p. 75, pl. xxi., f. 6. In Sphagnum pools, Waterloo Swamps.
83 S. longispinatus, ? Tatem, Quart. Jour. Micro. Sci., Vol. VII., 1867, p. 252. In Sphagnum pools, Waterloo Swmaps, rare.
84 S. unisetatus, Collins ; H. & G., Vol. II., p. 76, pl. xxi., f. 8. In Sphagnum pools, Waterloo Swamps.

Family SALPINADÆ.

85 Diaschiza paeta, Gosse, Rotifera, Vol. II., p. 79, pl. xxii., f. 11. Waterloo Swamps.
86 D. semipaeta, Gosse, Rotifera, Vol. II., p. 80, pl. xxii., f. 10. Wooli Creek, Cook's River.
87 Salpina eustala, Gosse, Rotifera, Vol. II., p. 85, pl. xxii., f. 5. Waterloo Swamps, June, 1889.

Family EUCHLANIDÆ.

88 Euchlanis dilatata, Ehr.; Hudson & Gosse, Rotifera, Vol. II., p. 90, pl. xxiii., f. 5. Very common, Botanical Gardens; Waterloo Swamps ; Parramatta Park.
89 E. triquetra, Ehr. ; H. & G., Rotifera, Vol. II., p. 91, pl. xxiii., f. 4. In Sphagnum pools, Waterloo Swamps.
90 E.? sp. A small species, the lorica terminates in a single long acute point which is very finely tuberculate. Sphagnum pools, Waterloo Swamps.
91 E. lynceus, Ehr. ; Pritchard, Infusoria, 1861, p. 696, pl. xxxiv., f. 445-6. Duck Creek, Clyde.

Family CATHYPNADÆ.

92 Cathypna luna, Ehr.; H. & G., Rotifera, Vol. II., p. 94, pl. xxiv., f. 4. Frequent, Botanical Gardens ; Waterloo Swamps.
93 C. sp. The shape of this species is like that of *C. sulcata*, but it is more depressed posteriorly and without dorsal grooves. In Sphagnum pools, Waterloo Swamps.
94 Monostyla lunaris, Ehr.; H. & G., Rotifera, Vol. II., p. 98, pl. xxv., f. 2. In boggy pools, Waterloo Swamps.
95 M. bulla, Gosse, Rotifera, Vol. II., p. 99, pl. xxv., f. 4. Common, Botanical Gardens ; Waterloo Swamps.

Family COLURIDÆ.

96 Colurus uncinatus, Ehr.; Hudson & Gosse, Rotifera, Vol. II., p. 103. Duck Creek, Clyde.
97 C. bicuspidatus, Ehr. ; H. & G., Rotifera, Vol. II., p. 102, pl. xxvi., f. 2. Botanical Gardens.
98 C. amblytelus, Gosse, Rotifera, Vol. II., p. 104, pl. xxvi., f. 5.

99 METOPIDIA LEPADELLA, Ehr.; H. & G., Rotifera, Vol. II., p. 106, pl. XXV., f. 6. Waterloo Swamps.
100 M. SOLIDUS, Gosse, Rotifera, Vol. II., p. 106, pl. XXV., f. 11. Botanic Gardens; Moore Park.
101 M. OXYSTERNUM, Gosse, Rotifera, Vol. II., p. 107, pl. XXV., f. 8. Very common, Waterloo Swamps, June 1889.

Family PTERODINADÆ.

102 PTERODINA PATINA, Ehr.; H. & Gosse, Rotifera, Vol. II., p. 112, pl. XXVI., f. 11. Very common, Moore Park, in an old stone quarry known as the "Horse Pond."
103 P. REFLEXA, Gosse, Jour. Royal Micro. Soc., Feb. 1887, p. 3, pl. i., f. 8. Common in Sphagnum pools, Waterloo Swamps.

Family BRACHIONIDÆ.

104 BRACHIONUS PALA, Ehr.; H. & G., Rotifera, Vol. II., p. 117, pl. XXVII., f. 3, pl. XXVIII., f. 3. Frequent in stagnant water, off Bourke Street at the back of the Waterloo Public School.
105 B. BAKERI, Ehr.; H. & G., Rotifera, Vol. II., p. 120, pl. XXVII., f. 8. Off Bourke Street, Waterloo.
106 B. MILITARIS, Ehr.; Pritchard's Infusoria, 1861, p. 711, pl. XXXIX., f. 21-22. Wooli Creek, Cook's River.
107 NOTEUS QUADRICORNIS, Ehr.; H. & G., Rotifera, Vol. II., p. 121, pl. XXVIII., f. 5. Waterloo Swamps.

Family ANURÆADÆ.

108 ANURÆA HYPELASMA, Gosse, Rotifera, Vol. II., p. 123, pl. XXIX., f. 6. In shallow grassy pools, Moore Park.
109 A. ACULEATA, Ehr.; H. & G., Rotifera, Vol. II., p. 123, pl. XXIX., f. 4. Botanical Gardens; Sphagnum pools, Waterloo Swamps.
110 A. COCHLEARIS, Gosse, Rotifera, Vol. II., p. 124, pl. XXIX., f. 7. Very common, Waterloo Swamps.

ARTHROPODA.

ENTOMOSTRACA.

Order PHYLLOPODA.

Sub-order Branchiopoda.

1 APUS SP. I am not aware of any species being found near Sydney, but there are examples in the Australian Museum from Mossgeil; Macquarie River and the Hunter River district.

2 LEPIDURUS SP. There are three examples of this species in the Australian Museum, labelled New South Wales.

3 LIMNADIA STANLEYANA, King, Proc. Royal Soc., Tasmania, 1854-5, p. 70 ; Trans. Entom. Soc., N.S.W., Vol. I., p. 162, pl. xi. Coogee (King) ; Moore Park (W).

4 L. SORDIDA, King, P.R.S., Tasmania, 1854-5, p. 70; T. Entom. Soc., N.S.W. Pond near Bondi Bay, (King); Moore Park; off Bunnerong Road, (W.)

5 LIMNETIS MACLEAYANA, King, P.R.S., Tas., p. 70; T. Entom. Soc., N.S.W., Vol. I., p. 162, pl. xi. In shallow pools, Moore Park, (W.); Denham Court, Botany, (King).

6 ARTEMIA PROXIMA, King, P.R.S., Tasm., p. 70 ; T. Entom. Soc., N.S.W., Vol. I., p. 162, pl. xi. Salt Pans, Newington.

7 CHIROCEPHALUS SP. There are three examples in the Australian Museum, collected by the late Mr. W. McGillivray near Yass, N.S.W. It is distinct from the European species.

8 ESTHERIA SP. This genus is represented by two or three species, but they are from the interior of the Colony.

Sub-order Cladocera.

DAPHNIIDÆ.

9 DAPHNIA CARINATA, Muller ; R. L. King, P.R. Soc., Tasmania 1852-3, p. 246, pl. i., var. GRAVIS, p. 252, pl. vi. A, var. CEPHALATA, pl. vi. B ; Proc. Entom. Soc., N.S.W., p. 164, pl. xii. Abundant in the Waterloo Swamps, (W.); Botany Swamps ; Parramatta ; Campbelltown, (King).

10 D. ELIZABETHÆ, King, P.R. Soc., Tasm., 1852-3, p. 247, pl. ii., var. ACUTIROSTRATA, p. 254, pl. vi. c. Sydney : Newtown Parramatta, (King) ; Waterloo Swamps ; Wooli Creek, and at Clyde (W.)

11 D. HONORATA, King, P.R.S., Tasm., 1852-3, p. 249, pl. iii. Sydney ; Parramatta, (King); off Bourke Street, (W.)

12 D. MUCRONATA, Muller ; King, P.R.S., Tasm., 1852-3, p. 255, pl. vi. E. South Creek ; Parramatta, (King); Moore Park.

13 MOINA LEMNÆ, King, P.R.S., Tasm., 1852-3, p. 250, pl. iv. In a small pond in a garden at Cook's River, (King); off Bourke Street, at the back of the Public School, Waterloo, (W.)

14 M. MACLEAYII, King, l.c., p. 251, pl. v. Pond near Elizabeth Bay, (King).

15 MACROTHRIX SPINOSA, King, l.c., p. 256, pl. vi., F. South Creek, (King).

LYNCEIDÆ.

16 EURYCERCUS SPINOSUS, King, l.c., p. 257, pl. vii., D. Pond on Liverpool Road ; Botany, (W.)

17 E. Cunninghami, King, l.c., p. 257, pl. vii., a. Pond in Botanic Gardens.
18 E. Cookii, King, l.c., Proc. Entom. Soc., N.S.W., Vol. i., p. 165, pl. xiii. Botany Swamps.
19 Chydorus angustus, King, l.c., p. 258, pl. vii., b. In a pond on Botany Road, (King).
20 C. Leonardii, King, l.c., p. 25, pl. vii. c. Near Waverley Mills; the Waterfall, St. Leonards; South Creek; Denham Court, (King).
21 Alona Bairdii, King, l.c., p. 259, pl. viii., a. Lachlan Swamp, (King).
22 A. pulchella, King, l.c., p. 260, pl. viii., b. St. Leonards, North Shore, (King).
23 A. diaphana, King, l.c., p. 260, pl. viii., c. Pond near Sydney.
24 A. Karua, King, l.c., p. 260, pl. viii., d. River Karua, near Stroud.
25 A. mascula, King, l.c., p. 261, pl. viii., e. In South Creek, at Dunheved, (King).
26 Dunhevedia crassa, King, l.c., p. 261, pl. vii., f. South Creek, at Dunheved; Varroville, near Denham Court, (King).
27 D. podagra, King, l.c., p. 261, pl. vii., e. Ponds behind the old Military Barracks at Parramatta, (King.)

Order OSTRACODA,
Family CYPRIDÆ.

28 Cypris carinata, King, P.R.S., Tasmania, 1854-5, p. 61, pl. ix. c, 1-4. Denham Court in a pond about a mile from the turnpike road, (King).
29 C. Bennelong, King, l.c., 1854-5, p. 63, pl. x. a. Sydney Cove, in a pond close to the edge of the saltwater, (King).
30 C. Clarkii, King, l.c., 1854-5, p. 63, pl. x. e. Sydney and Parramatta, (King).
31 C. Scottii, King, l.c., 1854-5, p. 63, pl. x. c. Denham Court with *C. carinata*, (King).
32 C. Minna, King, l.c., 1854-5, p. 64, pl. x. b; var. (a) castania, Varroville, Denham Court; var. (b) Brunnea, in the Domain, Sydney, (King).
33 C. lateraria, King, l.c, 1854-5, p. 65, pl. x. g. Pond in a brickfield near Sydney, (King).
34 C. Sydneia, King, l.c., 1854-6, p. 65, pl. x., m. In a swamp near Woolloomooloo Bay, (King).
35 C. Candonioides, King, l.c., 1854-5, p. 66, pl. x. f. Varroville, (King).
36 C. Varrovillia, King, l.c., 1854-5, p. 66, pl. x. d. Varroville, (King).

37 Candona Stanleyana, King, l.c., 1854-5, p. 66, pl. x. h. Ponds on the top of sandstone rocks overlooking the sea near Coogee, associated with *Limnadia*, and *Newnhamia fenestrata*.

38 C. lutea, King, l.c., p. 67, pl. x. g. In a pond near Sydney Cove with *C. Bennelong*, (King).

39 Notodromus fenestrata, King, l.c., p. 67, pl. ix. a, 1-2, (as *Newhamia*). Common in ponds, Sydney, (King.)

40 N. Guliemi, King, l.c., p. 67. Dunheved, South Creek in a shallow pond, (King).

Order COPEPODA.

41 Cyclops australis, King, l.c., 1854-5, p. 74. Abundant, Waterloo Swamps, (W.); common in ponds, (King).

42 Diaptomus pollux, King, ? l.c., 1854-5, p. 74. Parramatta; Sydney.

43 D. uxorius, King, ? l.c., 1854-5, p. 74. Port Stephens.

44 D. Maria, King, l.c., 1854-5, p. 74. Denham Court.

45 D. Cookii, King, l.c. Locality ?

Tribe Macroura.

Family ASTACIDÆ.

46 Astacopsis serratus, Shaw, Zool. of New Holland, pl. viii.; Haswell, Cat. Crust., p. 164. Waterloo Swamps, Mossman's Bay in the fresh-water Creek, (W.)

47 A. Parramattensis, Spence Bate, C.R., Vol. xxiv., p. 202, pl. xxvii., f. 1. Parramatta River.

48 A. Sydneyensis, Spence Bate, C.R., Vol. xxiv., p. 204, pl. xxii., f. 2. Sydney. It seems to me that the two last are only the young of the first which is a very variable species.

49 A. plebejus, Hess., Arch. fur Natur., 31, p. 164, pl. vii., f. 17, 1865; Haswell, Cat. Crust., p. 175. Sydney ? (Hess.)

Family PALÆMONIDÆ.

50 Palæmon sp. Parramatta Park.

MOLLUSCA (Fresh-water).

Class PELECYPODA.

Order SIPHONIDA.

Sub-order Integripalliata.

Family CYRENIIDÆ.

1 Corbicula Nepeanensis, Lesson, Voy. "Coquille," Vol. II., p. 428, pl. xiii., f. 14 ; Smith, J. Linn. Soc., London, Vol. xvi., p. 300, pl. vii., f. 26-27. South Creek ; Nepean River.

2 Sphærium Macgillivrayi, E. A. Smith, P.L.S., Vol. xvi., p. 305, pl. vii., f. 34. Nepean River at Penrith.

3 Pisidium Etheridgei, Smith, J.L.S., Vol. xvi., p. 306, pl. vii., f. 35. In a pond at the back of the Randwick toll-bar house, (W.)

Order ASIPHONIDA.

Sub-order Homomyaria.

Family UNIONIDÆ.

4 Unio australis, Lamarck ; Hanley, Recent Shells, p. 192, pl. xxi., f. 25. South Creek.

5 U. depressus, Lamarck ; = *U. cultelliformis*, Conrad, Jour. Acad. N. Sci., Phil., 1854, p. 295, pl. xxvi., f. 2, = *U. Parramattensis*, = *U. Nepeanensis*. Abundant in the river at Parramatta.

Class GASTEROPODA.

Sub-Class Prosobranchiata.

Order PECTINIBRANCHIATA.

Family RISSOIDÆ.

Sub-Family Bythininæ.

6 Bythinia australis, Tryon, Amer. Jour. Conch., Vol. I., p. 220, pl. xxii., f. 7, (Gabbia). Abundant in waterholes in Parramatta Park, (W.)

Family ASSIMNINIDÆ.

7 Assimnia Tasmanica, Tenison-Woods, P.R.S., Tasmania, 1875 p. 79. Mangrove Swamps, Cook's River.

Family TRUNCATELLIDÆ.

8 Truncatella valida, Pfeiffer, Monographia Auriculaceorum, Appendix II., p. 184. Within the tidal zone, Elizabeth Bay ; Shark Island, (Brazier.)

9 T. Brazieri, Cox, Monograph Aust. Land Shells, p. 93, pl. xv., f. 12 a and b. About one foot above high-water mark Miller's Point, (Brazier).

Sub-Class PULMONATA.

Order BASOMMATOPHORA.

Sub-order Hydrophila.

Family LIMNÆIDÆ.

Sub-Family LIMNÆINÆ.

10 LIMNÆA LESSONI, Deshayes, Magasin de Zool., 1830, p. 16, f. 1-2 ; Lesson, Voy. "Coquille," pl. xv., f. 1. South Creek ; Parramatta.

11 L. BRAZIERI, Smith, J.L.S., Vol. XVI., p. 274, pl. v., f. 15. Glebe Point on a flat rock with clear water running over them, (Brazier).

12 PHYSA LESSONI, Smith, J.L.S., Vol. XVI., p. 277, pl. v., f. 21-22. South Creek.

13 P. GIBBOSA, Gould ; Sow., Conch. Icon., Vol. XIX., pl. iv., f. 27; Smith, l.c., p. 278, pl. vi., f. 3-6, var. ADAMSIANA, Canefri. Waterloo Swamps.

14 P. DISPAR, Sowerby, Conch. Icon., Vol. XIX., pl. viii., f. 66 a-b. Sydney, (Sowerby).

15 P. BULLATA, Sowerby, Conch. Icon., Vol. XIX., pl. xii., f. 97. Botanical Gardens, (Brazier.)

Sub-Family PLANORBINÆ.

16 SEGMENTINA AUSTRALIENSIS, Smith, l.c., p. 296, pl. vii., f. 7-10. Common in Shea's Creek at the back of Forsyth's Rope Works, Bourke Street.

Sub-Family ANCYLINÆ.

17 ANCYLUS AUSTRALICUS, Tate, Trans. Roy. Soc., S. Australia, Vol. III., 1880, p. 102, pl. iv., f. 4 a-b ; Smith, l.c., p. 297, pl. vii., f. 36-37. South Creek, (Brazier).

18 A. SMITHII, Cox, P.L.S., N.S.W., part iii., 1889. On Vallisneria, Port Hacking.

POLYZOA (Freshwater).

CTENOSTOMATA.

Family VICTORELLIDÆ.

1 VICTORELLA PAVIDA, ? Saville Kent, Quart. Jour. Micro. Sci., Vol. x., New Series, 1870, p. 34 ; Hincks, Brit. Marine Polyzoa, p. 559, pl. lxxix., f. 4-7 ; Bousfield, Ann. & Mag. N.H., Vol. XVI., Ser. 5, p. 401, pl. xii., f. 1-3. In brackish water on a species of Nitella in company with a tube dwelling rotifer Œcistes sp., Cook's River.

Order PHYLACTOLÆMATA.

Family PLUMATELLIDÆ.

2 PLUMATELLA APLINII, McGillivray, P.R. Soc., Vict., 1860-1, Vol. v., p. 204. On weeds in Wooli Creek, Cook's River; Waterloo Swamps; Parramatta.

3 P. SP. On the stems of rushes in the Horse Pond, Moore Park.

4 P. SP. On the stems of rushes and the leaf-stalks of Marsilia, Duck Creek, Clyde.

5 ALCYONELLA SP. The statoblasts of this species resemble those of *Plumatella fruticosa* in shape and are much narrower than those of *A. fungosa*.

6 LOPHOPUS LENDENFELDI, S. O. Ridley, J. Linn. Soc., London, Vol. xx., p. 61, pl. ii. I found this species in January 1886, on the stems of aquatic plants in Parramatta Park near the footbridge in deep water, and I killed specimens with the tentacles fairly extended, some of which I gave to Dr. R. v. Lendenfeld when leaving this country, asking him to hand them over to Prof. Allman for description. When he arrived in London he appears to have presented a specimen to the British Museum, so that it has been inferred to be his own collecting, and in consequence the name *L. Lendenfeldi* has been given to it.

7 FREDERICELLA SP. This is closely allied to *F. sultana*, but the statoblasts are nearly round and not bean shaped. In Shea's Creek, Waterloo Swamps, abundant in 1884. The same or another species is found in Parramatta Park near the footbridge.

ERRATA.

Page 169, Line 17, for Vol. XXIX., read Vol. XXVII.
„ 171, No. 8, for semilulum, read *seminulum*.
„ 172, „ 23, „ pilulifa, read *pilulifera*.
„ 173, „ 48, „ Ehrembergina, read Ehrenbergina.
„ 180, „ Chondrosspongiæ, read *Chondrospongiæ*.
„ 186, „ 195, „ aruscula, read arbuscula.
„ 186, „ 208, „ Thallasodendron, read Thalassodendron.
„ 203, „ 69, „ Uniophra, read *Uniophora*.
„ 203, „ 73, „ Centrosphephanus, read *Centrostephanus*.
„ 218, „ 110, „ macullta, read *maculata*.
„ 218, „ 110, „ Cci., read *Sci*.
„ 252, „ 306, „ Pearse read *Pease*.
„ 293, „ 179, „ Moroubra, read *Maroubra*.
„ 295, „ 25, „ Green Joint, read *Green Point*.

THE ANALYSIS OF PRICKLY PEAR.

By W. M. Hamlet, F.C.S., F.I.C., Government Analyst.

[*Read before the Royal Society of N.S.W., October 2, 1889.*]

The specimens selected for analysis were those of *Opuntia Braziliensis* in fresh vigorous condition, but the fruit was not quite ripe. The prickles having been carefully removed, the following results were obtained from a hundred parts of the fresh plant :—

Water	89·60
Fat	·42
Extract soluble in alcohol	·16
*Albuminoids (flesh-forming matters) ...	1·07
Starch	trace
Arabin, Pectose or digestible fibre	6·77
Cellulose (woody fibre)	·54
†Mineral matter (Ash)	1·43
	99·99

If, in the estimation of its value as a fodder plant we exclude the prickles, the prickly pear will be found to possess a nutritive value equal to that of the melon or to the common cabbage. Obviously the chief, but not insurmountable difficulty attending its use as fodder for stock is the presence of two distinct sets of prickles, one being the long hard spines, the other the fine short spiculæ formed in tufts upon the fruit, both of which combine to make a very formidable defence to the plant against the approach of sheep and cattle ; a barrier never invaded by the latter except when hard pressed by hunger in a dry season.

In the Brazils and in some parts of Mexico, horses and wild cattle will attack this prickly cactus in a remarkable manner. This is accomplished by the animals turning round upon the plant and stamping it down with their hind legs until they have sufficiently mashed the leaves and destroyed the prickles, whereupon they are able to eat it.

Stock may however be saved this labour by the simple process of burning the spines off by roasting in heaps after cutting down by bill-hooks or scythes, or by means of a pulping machine suit-

* Containing Nitrogen 0·17. † Containing Potash ·92.

able for the purpose. Thus the prickly pear which is a pest and a bugbear to many of our selectors and squatters, instead of being a nuisance might be profitably turned to account as fodder. It is known everywhere that the pear loves a warm dry climate and thrives luxuriantly in dry places in many parts of the colony where there is but a very scanty rainfall. Moreover it is a sweet succulent plant containing in the hottest weather as much water as an ordinary cabbage.

Discussion.

The Hon, L. J. De Salis, M.L.C., thanked Mr. Hamlet for having investigated the matter so well as it showed that this plant which had so long been looked upon as a wasted source of nature, or a nuisance, was really a valuable plant in times of drought owing to the large quantity of water it contained. He thought that the aloe might, with advantage, be cultivated here as he believed there was some relationship between the nature of the two plants.

ON THE OCCURRENCE OF ARABIN IN THE PRICKLY PEAR, *(Opuntia Braziliensis)*.

By W. M. Hamlet, F.C.S., F.I.C., Government Analyst.

[*Read before the Royal Society of N.S.W., October 2, 1889.*]

(Preliminary Note.)

During an investigation made with this variety of Prickly Pear a mucilaginous body is met with in extracting the pulp with water giving a faint acid reaction. Several pounds weight of the pear was chopped fine and digested with pure water for 24 hours. A clear glairy jelly-like substance was obtained, which upon drying formed horny granular masses somewhat resembling common gum arabic, and found to be soluble in water but precipitated by alcohol and ether, forming milky-white tears. On boiling with dilute sulphuric acid a substance having all the properties of dextrin was obtained, while further hydrolysis resulted in the production of a fermentable sugar precipitated by Fehling solution, (Arabinose). On oxidation with nitric acid, the sugar molecule was resolved into mucic and finally into oxalic acid. The aqueous solution of the extract became tinted on keeping, developing finally into a deep rose colour. Not sufficient of the sugar-like body was obtained for the purpose of determining its action on polarised light.

NOTES ON SOME MINERALS &c.

By C. H. Mingaye, F.C.S.

[*Read before the Royal Society of N.S.W., November 6, 1889.*]

Platinum.

This metal was recently found in a ferruginous felspathic lode-stuff obtained from the Broken Hill district, the specimens in question yielding on assay as follows :—

I. Ochreous felspathic lode-stuff.—Platinum at the rate of 1 oz. 9 dwts. 9 grs. per ton.

II. Compact ferruginous claystone.—Platinum at the rate of 6 dwts. 12 grs. per ton.

III. Ferruginous felspathic rock stained green with carbonate of copper.—Platinum a heavy trace (under 5 grs. per ton).

The last two samples yielded a minute trace of gold.

From a geological point of view the occurrence of the metal platinum in lode material is one of great interest, this being the first case on record in this colony of it having been found otherwise than in alluvial deposits ; and I think I may say the second elsewhere. The metal is evidently in a very fine state of division as on panning off a quantity of the mineral it was found extremely difficult to save the platinum, hence it will be a very hard matter to concentrate the material, and a grave question as to whether it can be profitably extracted : the metal being worth about 28s. to 30s. per oz. in the crude state.

Platinum has hitherto been found in small quantities in the Richmond River, Clarence River, and Bathurst districts, in the two former places occurring in very fine grains through the sand. Mr. W. A. Dixon, F.I.C., etc., reports in 1878* that he found a small quantity of platinum in the sand along the sea coast near the Richmond River, yielding 5 grains per ton, and gold at the rate of 1 dwt. 5 grs. per ton. Having examined various samples of the sand procured from that district, I can bear out the statement made by that gentleman, as on two occasions I detected platinum in small quantities much too small to pay to profitably concentrate the sand. A sample of black sand forwarded to the Department some four years ago, obtained from the Bathurst district was found to be very rich in platinum and gold, but the percentage was not determined.

In the Journal of the Chemical Society for September 1889 an article is given by Messrs. F. W. Clarke and C. Catlett, stating that they had examined a number of samples of nickel ore from

* Vide Annual Report Department of Mines, 1878.

the Sudbury Mines Ontario, Canada, with the result that 2·55 oz. to the ton or ·0087 per cent of platinum was found. These gentlemen also remark that the occurrence of platinum in such appreciable quantities in an ore of such a character is remarkable, but whether it could be profitably extracted is an open question.

In the Engineer and Mining Journal, July 27th, 1889, is an article reporting the finding of a platinum arsenide "sperylite." That platinum should occur in lode material is only natural, and its presence in situ having been seldom recorded is no doubt due to not testing the various lode materials for the presence of that metal.

Analysis of a sample of water obtained from a bore put down at Cuttaburra, N.S.W.

	Grains per Gallon.
Silica	1·596
Protoxide of Iron	·112
Alumina	trace
Carbonate of Lime	6·664
Carbonate of Magnesia	·336
Chloride of Sodium	349·040
Chloride of Potassium	trace
Chloride of Calcium	27·580
Chloride of Magnesium	4·190
Chloride of Ammonium	·642
Alkaline Carbonates, Organic Matter, Strong trace of Bromine, trace of Iodine, Lithia, Nitrates etc.	6·712
	396·872

Total fixed residue found = 396·872 grains per gallon. The small quantity of water received for the purpose of analysis I regret to say prevented an estimation of the bromine being made, but the quantity present is very small, it was also found impossible to estimate some of the other constituents for the same reason.

Bromine and iodine have been detected in some of the mineral waters of South America. Mr. Hamlet, F.C.S., informed me he detected a small quantity of iodine in a mineral water obtained in New South Wales.

Chatin detected iodine in all fresh-water plants, but not in land plants, therefore all waters taken from rivers and fresh-water ponds should contain traces of iodine, though the quantity present in most cases would be very minute.*

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* (Jour. Pharm. Chim. (3) xxvii., 418.)

Marchand also states that all natural waters contain iodine and bromine.* Van Ankum has shown that iodine is present in almost all the potable waters of Holland.

Wehrlite.

The specimen exhibited sometimes designated "Mirror-glance" was obtained from the Mount Shamrock Gold Mine, Queensland, the sample being left with me by Captain Eldred, Margaret Street Sydney, for the purpose of identification.

The mineral may be described as follows :—Massive thin foliated crystals of a light steel-grey colour, bright lustre, contained in a matrix, consisting of silica and carbonate of lime. The hardness is between 1 and 2. The Sp. Gr. of a crystal free from gangue = 8·05. Previously found at Pilsen in Hungary.

NOTES ON GOULBURN LIME.

By E. C. Manfred.

[*Read before the Royal Society of N.S.W., November 6, 1889.*]

The country in which this Lime-stone is found has been very carefully described by the late Dr. A. M. Thomson, in article No. 6, Vol. III., of this Society's Journal for the year 1869, so that reference can easily be made thereto for any information of a geological character. All the lime now burnt is obtained at Kingsdale about four miles from Goulburn, and although quarries have been opened at Baw Baw and Rossiville, places almost the same distance from Goulburn, and on the same line of country; they are not at present being worked. Large quantities are burnt for building purposes, the lime being used not only in the district, but also being sent to Sydney.

The stone is light grey in colour, hard and crystalline and interspersed with white veins, it loses over one third its weight in burning and its specific gravity is about 2·82. It exists in large quantities, but is not quarried to any great depth, probably the cost of cartage from the quarry makes the getting too expensive if taken from more than a moderate depth.

The process of burning is carried on simply in open flare kilns on the intermittent system, that is to say, the kilns are charged,

* (Compte Rendu, xxxi., 495.)

burnt, cooled down and then emptied and recharged. Wood is always used as fuel, although it is now getting scarce and it is probably only a question of time when coal will have to be used.

An analysis of the stone made by the writer just as it is taken from the quarry, gives :—

Silica etc	2·9
Iron, Alumina, etc.	2·2
Carbonate Lime	85·3
Carbonate Magnesia	5·1
Loss	4·5
	100·0

The carbonic acid was estimated several times separately.

The lime is fairly white in colour after being burnt, although nothing like so white as the lime burnt at Lake Bathurst. Its specific gravity when burnt is about 3·25. Its tensile strength as a mortar per square inch was estimated by making up various proportions of quick lime and sand by measure. The sand was all clean washed, caught on a 900 sieve, and having a specific gravity of 2·52. The moulds used were after Faija's pattern,* and six briquettes were broken in each case. Thus one part lime and four parts sand, broke at 28½lbs. ; one part lime and eight parts sand broke at 24½lbs. With less than one and four no better result was obtained. The blocks were all tested about twelve months after being made. A test with two parts lime and one part plaster of paris, the briquettes averaged 112lbs.; the neat plaster used breaking at 322lbs. All the briquettes were tested in a machine of Dr. Michäelis pattern, the lighter weights being ascertained by using only one lever having a multiplying power of 10.

Vicat classes lime mortar from bad to good as taking 20 to 50lbs. per square inch, so that this lime cannot take a very good place on the scale, so far as the analysis goes it may be classed as a poor lime having very slight hydraulic properties. When once it has become hard in the air, it resists water fairly well, but for anything like hydraulic work it is utterly unsuitable. With a fairly coarse sand, such as would be caught on a 900 sieve, a stronger mortar is obtained than with a finer sand, this being probably due to the air being able to circulate through the mortar more freely, on the other hand a better result is obtained with some fine sands than with others, this being probably due to a difference in composition.

* Portland Cement for Users, by H. Faija, p. 63.

Taking a sample of portland cement, which gave a strength of 580lbs. at three months* and with six parts coarse sand 68lbs., then probably a stronger mortar would be obtained at the same cost, with eight to one cement, than with lime mortar; the mechanical difficulty however of using such a poor cement mortar for anything like neat work makes the lime mortar the cheapest for ordinary work.

WEDNESDAY, OCTOBER 2, 1889.

Prof. LIVERSIDGE, M.A., F.R.S., President, in the Chair.

Twenty-two members were present.

The minutes of the preceding meeting were read and confirmed.

The certificates of one candidate was read for the third time, of three for the second time, and of one for the first time.

The following gentleman was duly elected an ordinary member of the Society :—

Gale, Walter Frederick; Sydney.

The following letter was read :—

M. Le President—It will be very kind on your part if you will let me know the names of the members of your Society who devote their time to Zoology—especially those who possess collections of mammifera, birds, reptiles, insects, shelled or otherwise. For many years I have given my attention to *Hybridation*—that is to say, to the crossings of different species, whether so produced either in a state of freedom or in captivity. I can only arrive at a satisfactory result by consulting those naturalists who have themselves been enabled to observe certain cases, or who by means of their connections can refer me to other naturalists, collectors, either amateurs or breeders. And if you yourself M. le President have any knowledge of any of these facts, whether by study, reading or otherwise, I shall be extremely obliged to you if you will let me know. I really cannot sufficiently excuse myself for the liberty I am taking, not having even the honour of your acquaintance, nevertheless I trust that you will have the goodness to address me a few words in reply for which in advance I tender you a thousand thanks, I beg M. le President that you will accept the expression of my most sincere and grateful feelings.

Signed A. SUCHETET,

(*pres* Godervilly, Seine Inférieure,
July 1st, 1889.

Proprietaire à Breautè au chateau d'Auteville.

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* This sample was not put under water as is usually done for testing.

Mr. W. M. Hamlet, F.C.S., F.I.C., Government Analyst read the following papers :—1 The Analysis of Prickly Pear, 2 On the occurrence of Arabin in the Prickly Pear, *Opuntia Brasiliensis*. Some remarks were made by the Hon. L. F. DeSalis, M.L.C., and the Chairman.

The Hon. Secretary (Mr. Kyngdon) in the absence of the author, read a paper by Mr. Edward Stephens, on "Personal Recollections of the Aboriginal Tribes once inhabiting the Adelaide Plains of South Australia." A discussion followed in which Messrs J. F. Mann, P. N. Trebeck, the Hon. L. F. De Salis and the Chairman took part.

The thanks of the Society were accorded to the various authors for their valuable papers.

Professor Liversidge exhibited some interesting fungoid growths which had formed in water containing finely divided gold in suspension. The gold had been precipitated from a weak solution of the chloride by phosphorous dissolved in ether, the mycelium of the fungoid growths had acquired a purple colour from the gold which it had absorbed ; on incineration a skeleton outline of the mycelium is left in gold.

The following donations were laid upon the table and acknowledged :—

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MISCELLANEOUS.

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THE AUSTRALIAN ABORIGINES.

By Rev. John Mathew, M.A., Coburg, Victoria.

[With Plate and Map.]

[*Read before the Royal Society, N.S.W., December 4, 1889.*]

Prefatory Note.

Obligations have been generally acknowledged by exact references *in loco*, but the writer desires to express special indebtedness to the work of his friend, the late Mr. E. M. Curr, on "The Australian Race," which from its comprehensiveness and especially from its abundant vocabularies has been of very great service, although some of Mr. Curr's main conclusions have been widely different from those enunciated in this essay.

The Origin of the Australian Race.

In entering upon a study of the Australian Aborigines, the question "Who are they?" meets one upon the very threshold. Is the common belief correct that the dusky barbarians whose last vestiges are now rapidly melting away are the real indigenes? or is their being so called the result of hasty careless observation and imperfect knowledge? To call them the Aborigines is convenient, especially as they have from their first appearance in history been so called, and as they seem homogeneous and without rival claimants to the distinction, but without any desire or hope of depriving them of the title it will be easy to prove that it does not properly belong to them.

At the time when this southern continent was known as New Holland its inhabitants were loosely designated Papuans. But after British settlement, observers among the colonists by comparing the natives with typical Melanesians, could readily perceive very marked physiological differences and some colonial writers hit upon the hypothesis that the Australians were of mixed Papuan and Malay blood. The evidence in support was only the geographical position of Australia and the physical features of its people superficially scanned, and was so slight as to leave the allegation only a bare assumption. How, when, or where the fusion took place, if not insoluble the solution was not attempted.

The quite recent theory of Dr. Lesson, clearly and confidently stated is almost identical with this dimly conceived one, but is better substantiated. On physiological grounds Dr. Lesson * denies that the Australians have anything in common with the

* *Dr. A. Lesson, Les Polynesiens, Paris*, 1880, Vol. I., p. 104.

people of India, and he argues that in Australia and Tasmania three different races have combined, two of these being black the other light brown or yellow *(jaune)*. One of the black races was of short stature and brachycephalic or mesaticephalic, the other tall and dolichocephalic, while the third or yellow race was hypo-dolicho-cephalic. The Tasmanians he regards as the issue of the two first, the Australians of the two last. The brachiocephalic race he identifies with the Negrito, the dolichocephalic with the Papuan, and the fair race with the Malay. His conclusion is based almost exclusively upon premises derived from craniometry which according to Huxley is of little or no value for determining racial origin.

If the Papuans of New Guinea and of Tasmania respectively be classed as different races, I am not disposed to deny absolutely that two dark races and not one only, have formed the basis of the Australian race, because, as will be demonstrated, it is certain that people of the Tasmanian type have left traces in most parts of the continent and it is anything but improbable that a sprinkling of New Guineans should have affected the population in the north-east. But, if the opinion that a cross between two dark races once peopled Australia, involves the admission that the Tasmanians were such a cross, until the latter view receive some corroboration beyond conjecture the former must be discredited.

M. de Quatrefages held that the Tasmanians were a pure distinct race. Dr. Lesson does not assert the contrary, although he leans that way. A careful study of what is preserved of the Tasmanian language suggests that although phonologically it is uniform, there are some indications that a close analysis might resolve its constituents into two etymological elements and this may yet be done without proving that the original possessors of these elements belonged to different races. Judging however, from present knowledge one cannot help concluding that the Tasmanians were a distinct pure race and as homogeneous as any race in the world whether they should be denominated Negrito or Papuan. I entirely dissent from Dr. Lesson when he speaks of but one light coloured race, the Alfourous (Malays) being grafted on to the Australian Papuan, and I hope to be able to adduce abundant irrefragable evidence of immigrations of two distinct copper-skinned races.

The propinquity of Tasmania to the mainland naturally suggests the inference that both regions were at first peopled by the same race. Many accept this view off-hand without being aware how serious the objections are which it raises. Mr. Davies, quoted by Mr. R. Brough Smyth,* indicates King George Sound as the part of

* Aborigines of Victoria, Introd. p. lxx.

Australia whence the Tasmanians set forth, but no proof is given. Dr. Latham mentions the same theory and gives some glossarial affinities, the validity of which as evidence Mr. E. M. Curr † in his recent work *The Australian Race*, very severely shakes, shewing that a number of the words compared are not authenticated, and that of authenticated words only one of those given by Latham is represented in both Australian and Tasmanian speech. But Dr. Latham himself pronounces against concluding close relationship of races from contiguity of their abodes, and by suggesting stronger affinities between the New Caledonian and Tasmanian tongues than between Australian and Tasmanian, leads his readers to prefer thinking that the migration to Tasmania had come by way of New Caledonia rather than from the mainland.

That a true relationship subsists between the Australians and the Dravidians of India is now admitted by investigators generally on grounds too firm to be controverted, as I cannot help thinking notwithstanding Dr. F. Müller's stout assertions to the contrary.

The latest theory of the origin of the Australians is that advanced by Mr. E. M. Curr. He follows Mr. Hyde Clarke in citing resemblances between African and Australian words. Mr. Curr ‡ concludes that the Australians and Tasmanians were respectively distinct off-shoots from the African race, that the present occupants of Australia are its aborigines, and are so homogeneous that the founders of the race may all have arrived in the one canoe. He is at great pains to prove that Australia was never inhabited by the same race as the Tasmanians sprang from, that in fact the Australians and Tasmanians have never met since first one of the branches was severed from the parent Negro stock.

Now, what if all these diverse theories contain some measure of truth? What if the aboriginal inhabitants of Australia were closely allied to the African Negro! What if the Tasmanian race so lately extinct, merely crossed Bass' Strait to their island and last home! What if the present dark Australian race be, in a large degree, a mixture of Malay and Papuan blood with the latter element so much predominating as to justify the old geographers' designating the Australians Papuans!

The theory which the writer enunciates accounts for the difficulties which give rise to these divergent views and may be stated briefly as follows:—Australia was first occupied by a homogeneous people, a branch of the Papuan family, and closely related to the Negroes. They came from the north, but whether from New Guinea or any other island of the Eastern Archipelago is a matter of indifference and impossible to decide, as probably at the

† The Australian Race, Vol. III., pp. 600, *et seq.*

‡ The Australian Race, Vol. I., p. 189, Vol. III., p. 604.

time of their arrival the islands to the north were all inhabited by people of the same blood. These first-comers, the veritable Australian Aborigines, occupied all the continent, and having spread right across to the southern shores they crossed, what is now Bass' Strait, but which at that distant date may have been dry land, and their migration terminated in Tasmania.

Then followed one invasion, if not two, by hostile people of much fairer complexion. The un-Papuan element now discernible in the Australian race is not the trace of one pure race, but is composite, the constituents being Dravidian and Malay blood. Of these the Dravidian was the first to arrive, the Malay coming later, and in a desultory way by detachments at irregular intervals. It is more convenient than accurate to designate one of these components as Dravidian, it would be more precise to speak of it as of the same stock as the Dravidian, or perhaps better still as Central Indian. There are features observable in Australian marriage laws and indelibly fixed in Australian language which attest a real affinity between the Australians and the people of Southern and Central India. The different batches of fair-skinned invaders may have had different landing places. Mainly from linguistic evidence I incline to think that the people, who for convenience may be called Dravidians, first touched on the north-west coast about the part now known as the Kimberley District and advanced inland, eastward and southward. It seems to me that this ingredient of the population came not in one boat-load, but in an unintermittent stream for many years, probably being forced southwards through Java and Timor by the attacks of a more powerful race. Coming as a later off-shoot from the first home of humanity, this invading band was of higher intelligence and better equipped for conflict than the indigenes of Australia. Physically they were more lithe and wiry and of taller stature. They were lighter in colour, though a dark race, less hirsute and the hair of their head was perfectly straight. Their language was not very dissimilar in phonology, but differed greatly in vocabulary. There is a natural highway easily traversed across Australia from the shores of the Gulf of Carpentaria to the south, by first ascending the rivers on the northern watershed and then descending those on the southern watershed until the ocean is reached at the mouth of the Murray. If we suppose the Dravidian invaders to have gained the rivers that flow into the Gulf of Carpentaria on its southern side, thence they would rapidly pour southward in a strong stream fighting their way with the aboriginal population, part of which they would absorb—chiefly by the capture of women—part they would destroy, the remainder would keep retiring. The stream of invasion would here and there send forth branches which reaching the coast at various points would rebound and

eddy backwards. If this process of settlement corresponds to fact we should expect to find greater differences in appearance, language and customs between the people of the interior and the people of the coast, than between those on the seaboard at points widely apart. Neglecting irregularities, which must be anticipated to occur here and there owing to inequality of distribution of the population, we should expect to find a shading more or less marked from the interior outwards, in complexion, physique, and other respects; the outer fringe of population, excepting along the north and north-west coasts, being most distinctly Papuan. And the facts correspond with the requirements sufficiently close to strongly support the above hypothesis.

As regards Malay incursions, while there may have been a continuous intercourse between Malays and Australians on the north chiefly to the west of the Gulf, there are not wanting indications of occasional descents of Malay parties—even on the east coast—forming, if not colonies at least centres of influence, which have left unquestionable traces on the Australian language.

The theory of occupation which I have sketched widely differs from that propounded by Mr. Curr, who supposes that one boat-load of people might have been the progenitors of the whole race. He assumes that the landing was made near Port Darwin and that afterwards the aborigines were by pressure of circumstances divided into three main advancing lines, two taking the seaboard in opposite directions, and the third penetrating into the interior. all three meeting again on the south and south-east coast.

Mr. Bonwick's theory differs *toto cælo* from Mr. Curr's and in some particulars approaches more closely to the writer's He posits the existence of a great southern continent as Dumont d' Urville did, only Mr. Bonwick's continent would require to be more extensive, girdling almost the whole southern hemisphere, embracing the West Indies on the one side and the Chatham Islands on the other. Over all this vast continent people of Negro blood ranged and were finally separated and isolated by a general depression and submergence of most of the land in the ocean. Both the Papuan and Australian branches of the Negro family advanced from west to east, reaching their permanent home at a time before Tasmania was sundered from the mainland. *The Papuans may have moved freely between both lands*, but the Australians touched on the south-west of the mainland and spread northwards and eastwards. Mr. Curr and Mr. Bonwick are almost diametrically opposed as to direction of settlement.

We may be disposed willingly enough to adopt Mr. Hooker's theory based on botanical considerations and called in by Mr. Bonwick as corroborative testimony, that the southern continent was once of much greater area than it now is, (Mr. Wallace holds

a similar opinion*) but it can only be a last resort to account for the distribution of races by the submergence of hypothetical regions. Mr. Curr has adduced excellent reasons for concluding that at least the inhabitants of central Australia poured in from the north and there is no objection whatever to our supposing that the Papuan tide which first arrived also flowed hither in the same direction.

The Indigenes of Australia purely Papuan.

Having expressed the conviction that the aborigines of Australia were Papuan and that they were the ancestors of the Tasmanian race so recently extinct, I now propose to verify this hypothesis by presenting converging lines of cumulative evidence. There are proofs adducible from physiology, mythology, implements, customs and language, some more decisive and striking than others, but when combined so varied and powerful as, I think, to render my position incontestible.

Evidence from Physiology.

The argument most obvious and first suggested for identity of origin of two nations is contiguity of habitation, and if considerations were just as favourable to the conclusions that the Tasmanians had sprung from the mainland as from any other place, proximity might be called in to turn the balance. Proximity of abode is here mentioned as a favourable presupposition to racial affinity, and with this brief notice it can be passed over as unnecessary argument and open to the objection of being sometimes misleading.

With Peron and many others, the most powerful argument against deriving the Tasmanians from their neighbours across the Strait has been the extraordinary difference in appearance. Descriptions of the physique of the Tasmanians vary exceedingly, so much indeed that it might easily be imagined that the writers had seen people of races physically as unlike as the Kafirs and the Bushmen. But similar divergence of impression is to be found regarding the appearance of the Australians. One writer will describe them as emaciated, undersized, disproportioned creatures hardly human; another will describe them as light but muscular, firmly-knit men about as tall as Europeans. Much depends upon the subjective standard of comparison, the tribe met with, the number and circumstances of the individuals seen and the season of the year.

By a most careful comparison of various accounts of both races, and, judging from personal observation of the Australians, I am convinced that physiological differences narrow down to these:

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* The Malay Archipelago, p. 593.

that as compared with the natives of the continent the islanders were on the average of shorter stature, of much darker complexion and had hair of very different quality. The objections which these differences raise to community of origin dissolve in the prospect, when it is borne in mind that upon the aboriginal Australian stock there was grafted a strong Malayo-Dravidian shoot, for the effect of this graft is of itself sufficient to explain the ultimate divergence of feature.

The average height of the Australian male may be set down as 5 ft. 5 in., or 5 ft. 6 in., while that of the Tasmanian was only about 5 ft. 2 in. to 5 ft. 5 in.* Any one who has seen much of the Australian blacks cannot have failed to observe the great disparity in stature to be found among them whether as comparing together individuals of one tribe or individuals of different communities. Their height as well as general physique being dependent upon descent, climate, food-supply. I remember meeting with a tribe on the Nogoa River in Queensland, which seemed to me a remarkably fine body of people, both for stature and for strength of build, surpassing any natives I had seen elsewhere. We are told also that in some parts in the extreme north the natives are conspicuous for their height.

When communities are examined in detail it is found that a man's height will range from about 5 ft. to about 6 ft. 1 in. in the same tribe. I recall a singular example of this extreme difference in the case of two brothers, sons at least of the same mother. They belonged to the Kabi tribe occupying the head waters of the Mary River in Queensland. The younger brother named Kilkaibriu became a strapping fellow of about 6 ft. The elder brother Kagariu, was very little over 5 ft. high, and about as ugly, from a European point of view, as it were possible to conceive, in which respect no Tasmanian could surpass him. He came into public notice as Johnny Campbell the bushranger, and after a singularly daring and villainous career, ended his days on the gibbet at Brisbane. Taken by itself, this great diversity of stature among Australians might only be regarded as something abnormal, but when joined with other evidence does it not form a link in the chain upon which hangs the hypothesis of their descent here advanced. The offspring of a union between the Australian Papuans and people of greater stature would probably exceed in height the pure aborigines represented by the Tasmanians, and among posterity sprung from two or three distinct races differing from each other in average stature uniformity of height would hardly be expected, so that fact and theory coincide in this particular.

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* Bonwick, "Daily Life of the Tasmanians," p. 119.

It is freely admitted that the inhabitants of the island were unlike those of the mainland in skin-complexion, the difference however may be easily exaggerated. The Tasmanians were uniformly of a deep bluish-black colour, while the Australians are usually of a brownish-black, sometimes almost copper-coloured (especially the children) and invariably of a warm tint. I have noticed however, that when an Australian is wet and cold his skin receives a dull bluish tinge. There is great variety of shade among the natives of the mainland. In this respect again great differences are observable both between tribes in different localities and between members of the one community. Along the maritime lands on the east, south and west, the colour in many cases is very dark.

The people of both nations had luxuriant heads of hair. Some have called the hair of the Tasmanians woolly, others deny that it could properly be so called, and aver that it was rather excessively curly. The hair of the head was very abundant and generally grew in long thin ringlets. The hair of the continental people is on the contrary mostly wavy on the head, but often straight, and occasionally so curly as to resemble woolly hair, while the beard has invariably a great tendency to curl. As telling against the common origin of these peoples, a strong point is made of the difference in the quality of the hair. Mr. Curr has said * of the Australians that their hair is "sometimes straight and at others wavy, but never woolly," and in the next sentence that the hair of the Tasmanians was woolly.

As a matter of fact neither race had the hair woolly in the same sense as the Negro's hair is woolly, and yet the Tasmanian's might be called in a sense woolly (or wool-like) and there are cases where a kind of woolly hair has been noticed among the Australians. To corroborate the latter statement I have only to refer to Mr. Curr's own work.† Of a tribe of blacks in the Bunya Mountains, a contributor says that there were one or two cases of woolly hair. The present writer happens to have known these very persons, and the hair of one of them named Warun was so woolly that he used to be teazed in consequence and nicknamed "monkey" (sheep) and "wool" much to his vexation.

Mr. Jardine ‡ (the Explorer I presume) speaks of two types of Australians, one approaching a copper-colour, the other black. He says, the true Australian aborigines are perfectly black with generally *woolly heads of hair*. He speaks also of features of a strong Jewish cast, about which more will be said below. Major Mitchell (‖) saw some natives with a sort of woolly hair, and Mr.

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* The Australian Race, Vol. III., p. 603 ; † ditto, ditto, p. 153.
‡ Mr. R. Brough Smyth's "The Aborigines of Victoria," Vol. I., p. 19 ; (‖) Ditto, ditto, p. 18.

Stanbridge speaks * of isolated cases of woolly hair among the men. By the courtesy of a friend I have in my possession the photograph of a black boy whose hair was of the quality generally called woolly, his name was Wellington and he belonged to the Culgoa River, New South Wales.

In his "Daily Life of the Tasmanians," Mr. Bonwick says † regarding them, that their hair was not woolly nor like that of the Negro, he cites the opinion of Dr. Pruner Bey, that two specimens examined resembled the hair of the New Irelanders. If Mr. Curr can hold that notwithstanding the straightness of his hair "the Australian is by descent a Negro with a strong cross in him of some other race," there should be no difficulty on the score of difference of hair in the way of our regarding him as descended from the Austral Papuan or indigenous Australian with a strong cross of two other races both straight-haired.

The opinion of the Rev. Geo Taplin, an observer of large experience, is very noteworthy. He says,‡ "there is a remarkable difference in colour and cast of features, some natives have light complexions, straight hair, and a Malay countenance, while others have curly hair, are very black and have the features Papuan. *It is therefore probable that there are two races of aborigines.*" My own theory was formed before I had read this, and besides Mr. Taplin merely reiterates a supposition based certainly upon personal experience, but already propounded by earlier New South Wales writers, ‖ and apart from difference of appearance just quoted, he puts forth no proof of his statement.

The conclusion of so well-qualified an authority that there are probably two races of aborigines is in direct conflict with that of Mr. Huxley, who thinks that the natives of the southern and western portions of Australia are the most homogeneous of all savages. Observation is certainly against Mr. Huxley with whose opinion the statement of Dr. A. Lesson § may be compared, "the individual variations are too great, the study of the crania shews typical differences too accentuated for it to be possible to admit the unity and purity of the Australians."

The occurrence of strongly contrasted complexions, copper and almost jet black in the same tribe is exceedingly common. Some of the fairer skins are accompanied by light-coloured hair whether faded or natural. At Beemery Station, between Bourke and

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* Mr. R. Brough Smyth's "The Aborigines of Victoria," Vol. I., p. 15.

† Daily Life of the Tasmanians, p. 106.

‡ Native Tribes of South Australia, p. 129.

‖ Mr. Taplin regarded the Narrinyeri as descended from Polynesians and Papuans, and may have been the first to propound this special derivation.

§ Les Polynesiens, Vol. I., p. 104. Dr. A. Lesson, Paris, 1880.

Brewarrina, the family of the leading black were very fair and had long straw-coloured hair. I have heard of similar cases elsewhere, and have known one or two in southern Queensland.

Mr. Bonwick* quotes Mr. Earl as saying regarding Coburg Peninsula in the north-west of Australia, "the aboriginal inhabitants of this part of Australia very closely resemble the Papuans of New Guinea, or which is almost the same thing, the aborigines of Van Diemen's Land," and on the next page Mr. Oldfield is credited with stating that the Papuan race is still shewing through the Australian in a part of Western Australia, "the tribes," he says, "inhabiting the country from Murchison River to Shark's Bay possess more characteristics of the Negro family than the aborigines of any part of Australia." To the above evidence, attesting the greater prominence of Papuan characters in Western Australia let the following be added to shew the existence of a decided Papuan fringe at least on the south-eastern and western coasts with a departure from it landwards and in the north.

Of some fishing tribes Mr. Curr says† that they have very frizzy hair. Mr. A. W. Howitt speaking of Cooper's Creek blacks says,‡ "the aborigines don't differ much in appearance from the coast blacks, their hair is straighter and I think they are slighter in build, the curly hair so often seen on the Darling and Murray and elsewhere is not common."

Mr. Curr quotes Mr. Paul Foelsche as saying respecting the blacks of Northern Austrrlia :—"The majority of the men are well-built, but the skin is smooth and the stray covering of hair all over the body so often met with in the south is almost absent on the north coast . . . . the growth of hair on the face is very scanty."‖ As the character of the present Australian's hair is usually wavy, often curly and sometimes woolly, and as there is a special tendency to waviness towards the seaboard on the east, south, and west, these considerations encourage rather than forbid the belief that the origin of the Australians was as here maintained.

I shall now conclude the argument from physiology by adducing the evidence which may be called *nasal*, and which, as might naturally be expected, is by no means microscopical. A feature common to the Papuans, Australians, and Tasmanians is a hooked nose. Mr. Wallace who has studied carefully the Papuan and the Malay races says§ "the most universal character of the Papuan race is to have the nose prominent and large with the apex pro-

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* Daily Life of the Tasmanians, p. 262.

† The Australian Race, Vol. I., p. 39.

‡ Mr. R. Brough Smyth's "The Aborigines of Victoria, Vol. II., p. 301.

‖ Mr. Curr's "The Australian Race," Vol. I., p. 248.

§ The Malay Archipelago, p. 590.

duced downwards." According to Mr. Jardine's description of the true aboriginal features cited above, the nose is that of the Papuans. The Rev. W. Ridley speaks of having met with the Jewish nose among the Australian blacks. The fact is so obvious to any one who has seen many of the natives, as not to require to be pointed out, much less supported by quotations. And Mr. Backhouse observed † among the Tasmanian captives in Flinders Island, one especially whose features had a Jewish cast, and reminded him of the popular picture of Abraham. So that besides by the resemblances already noted the Australians and Tasmanians are related by the family likeness of the Jewish Papuan nose.

The Argument from Mythology and Tradition.

Some myths have been collected, chiefly in Victoria, which at first appear to be wild nonsensical fancies, but which are capable of a beautiful and rational interpretation and receive a special value when light is thrown upon them by the theory of preoccupation of the country by a distinct race. While on this point it will be necessary for me to quote freely from Mr. Smyth's Aborigines of Victoria, Vol. III., beginning at p. 423.

The aborigines of the northern parts of Victoria believe that the beings who created all things had severally the form of the crow and the eagle. There had been constant warfare between these two beings, but peace was made at length. They agreed that the Murray blacks should be divided into two classes, the Mokwarra (spelt variously) or Eagle-hawk, and the Kilparra or Crow. The conflict had been maintained with great vigour for a length of time, the crow taking every advantage of his nobler foe, but the latter generally had ample revenge. Out of their enmities and final agreement arose the two classes as has been said, and thence a law regulating marriages between these classes.

The Melbourne blacks say that Pundjel made of clay two males. He took stringy bark from the tree, made hair of it, and placed it on their heads, on one straight hair, and on the other curled hair. The man with the straight hair he called Ber rook Boorn, the man with the curled hair Koo-kin Ber-rook.

There is also a myth about Bundjel (or Pundjel) the first man and Karween (the second man) whom Bundjel made. They quarrelled about wives, but Karween spoke to Waung the crow and asked him to make a corroboree. And many crows came and they made a great light in the air and they sang. And then there was a fight with spears between Bundjel and Karween, the former being victor.

The following legend was current on the Murray. Before the earth was inhabited by the present existing race of black men,

† West's "History of Tasmania," p. 78.

birds had possession of it. These birds had as much intelligence and wisdom as the blacks, nay, some say that they were altogether wiser and more skilful. The eagle-hawk seems to have been the chief among the birds, and next to him in authority was the crow.

The progenitors of the existing tribes, whether birds, or beasts, or men, were set in the sky and made to shine as stars if the deeds they had done were mighty. The eagle is now the planet Mars, and justly so, because he was much given to fighting; the crow is also a star.

The Murray blacks have it that the crow killed the son of the eagle. This made the eagle very angry, so he set a trap for the crow, caught him and killed him, but the crow came to life again and disappeared.

The Gippsland blacks vary the legend by saying that the eagle left his son in charge of the mophawk while he himself went hunting. The mophawk sewed the eaglet up in a bag and left him. The eagle was irate, got the mophawk enclosed in the cavity of a hollow tree whence he was able to escape only by breaking his leg and using the bone of it to cut his way out. The eagle and the mophawk afterwards made a solemn agreement and treaty of peace, the conditions of which were as follows:—the eagle should have the privilege of going up into the topmost boughs of the trees so that he might from so great a height see better where kangaroos were feeding; and the mophawk was to have the right of occupying holes of trees: thus ended the disputes between the eagle and the mophawk.

The Rev. Geo. Taplin relates some myths of the Narrinyeri in South Australia, similar to the above.* Nurundere was the wonderful god or chief of this tribe. When he and his followers came down the Murray they found the country around the lakes in possession of clans of blacks under Wyungare and Nepelle. The last two of these heroes were translated to heaven and became stars. There is also a legend of a fight about fish between the pelicans and the magpies, when the latter were rolled in the ashes of a fire they had made and became black. This myth, like those about birds narrated above, will bear a similar interpretation.

Now what is to be made out of these myths? Are they tales "told by an idiot and signifying nothing," or are they confused evanescing echoes of a real past history? I take them to be the latter. Primitive man was fond of representing warfare carried on between beasts or birds endowed with human faculties, or between men and some of the lower animals, and men were united with beasts in all sorts of relations. A number of these relations are mentioned by Mr. McLennan,† such as the Minotaur and his

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* Native Tribes of South Australia, pp. 55 – 62.

† Studies in Ancient History, (London MacMillan & Co., 1886) p. 227, note.

parentage, Phorbas attaining the supremacy in Rhodes by freeing it of snakes, the conversion in Ægina of the ants into men, the Myrmidons; "and a score of such like facts." He asks what these relations meant, and suggests that among the Greeks there were tribes with *totems*—Bull, Boar, Lion, Snake, Ant, and Dragon tribes, just as there are tribes named after animals among the American Indians.

The prevalence of the designation of men by names of the lower animals is amply illustrated in the Old Testament scriptures. Take for instance the case of Jacob blessing his children* where Judah is a "lion's whelp," Issachar "a strong ass," Dan "a serpent by the way an adder in the path," Naphtali "a hind let loose," Benjamin "a ravening wolf." In the book of Daniel† the Empires are typified by four beasts. There is also the common appellation for Egypt "the dragon."‡

This ancient practice has been handed down to modern times in the heraldic bearings both of families and nations in civilized countries. The eagle has always been a choice crest, and it is scarcely matter of surprise that the king of birds so swift and fearless should be chosen as the emblem of a conquering people even in Australia.

Standing in close relation to these myths is the division of Australian communities into two classes, represented by the eaglehawk and the crow respectively, this dual division and particular representation being almost universal in Victoria, and extending with modifications into New South Wales and South Australia. In central and northern Victoria the eaglehawk and the crow are the only names of the two classes. Throughout much of the watershed of the Darling and the Murray on the authority of Mr. A. W. Howitt,† the eaglehawk is one of the primary class names, the second name being usually the crow. In the Turra tribe in South Australia bordering on the south-west of Victoria the seal takes the place of the crow. Yukembruk a class-name on the Upper Murray and at Maneroo means crow. Bearing upon this is the tradition of the blacks on the Lower Darling first placed on record by Mr. C. G. N. Lockhart in his annual report to the Government of New South Wales in 1852 or 1853, cited by Mr. Curr.‡ The tradition is that the first black man on the Darling had two wives Kilparra and Mokwarra. The sons of the one married the daughters of the other, and the class-names were inherited from the mothers. At King George Sound among a community of the Meenung blacks, the white cockatoo is substituted for the eaglehawk as one of the primary divisions, the

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* Gen. 49. † Dan. vii., 3. ‡ Isa. li., 9.

† Kamilroi and Kurnai, p. 288.

‡ The Australian Race, Vol. III., p. 165.

crow being the other.* At the most easterly point of Australia, between the Albert and Tweed Rivers the equivalent of "blacks" is Meebin, which also signifies eaglehawk, and even further north still, the name Dippil is applied by the Rev. W. Ridley who received it from Mr. Davies ("Darumboi") as an equivalent for Kabi, the name of the blacks in that quarter, and Dippil is evidently the same word as dibbil (eaglehawk) of the Brisbane River blacks. It is only natural to infer that these correspondences between the name of the race and that of the eaglehawk result from the fact that the dominant and predominant race was called after that bird. "Among the Kurnai," writes Mr. A. W. Howitt,† "the eaglehawk is greatly reverenced, he is regarded as the type of the bold and sagacious hunter . . . . . He figures in their tales in company with Ebing the little owl. Were it not too fanciful we might see in the quarrels of Gwanumerong and Ebing a trace of the severance of the original community into two classes or of a special disruption which may have impelled the Kurnai ancestry into Gippsland." Quite a different opinion of the significance of these quarrels is formed by the present writer.

When we take a conjunct view of the myths of the eaglehawk and the crow, the widespread currency and imperishable persistence of one or other of these names as applied to tribes or divisions of tribes, the Darling tradition of the aborigine with the two wives, is there any better explanation of the facts possible than that the eaglehawk and the crow represent two distinct races of men which once contested for the possession of Australia, the taller more powerful and more fierce "eaglehawk" race overcoming and in places exterminating the weaker, more scantily equipped sable "crows"? The struggle for supremacy began in the north and its last smouldering embers died out in Victoria, where traces of the once fierce fire have been left as clearly recognizable as the Victorian evidences of a former volcanic period, and a not inappropriate name, for the south-east of Australia at least, would be THE LAND OF THE EAGLEHAWK AND THE CROW.

The myths of Looern and Wiwonderrer suggest that they relate to untameable Papuans holding out for some time in the wildest parts of Victoria. Looern had his house at Wilson's Promontory. His country was that tract of heavily timbered ranges lying between the Promontory and Hoddle's Creek. Any native who dared to penetrate this country without the permission of Looern died a death awful to contemplate, because the torments preceding death were indescribable. The myth of Wiwonderrer is briefly stated thus:‡ There is a range north-east of Western

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* The Australian Race, Vol. I., p. 386.
† Kamilroi and Kurnai, pp. 322–3.
‡ Mr. Brough Smyth's, The Aborigines of Victoria, Vol. II., p. 453.

Port inhabited, the natives say, by an animal resembling a human being but with a body as hard as a stone. He used to kill many blacks. He was supported by people of his own. The blacks would not visit this range on any account.

Mr. Stanbridge states that the Boorong tribe who inhabit the Mallee country in the neighbourhood of Lake Tyrril have preserved an account of the Nurrum-bung-utrias or old spirits, a people who formerly possessed their country and who had the knowledge of fire. This tribe imagined the star Canobus to be the male crow, the first to bring fire from space and to give it to themselves, before which they were without it.*

There is a great resemblance between the Victorian and Tasmanian legends of the origin of fire and the apotheosis of heroes. Thus according to the Yarra blacks, Karakarook a female was the only one who could produce fire and she is now the seven stars (the Pleiades presumably). There is another Victorian myth to the effect that Toordt and Trrar came from the sky to show the blacks where the crow (that hostile wicked crow again) had hidden fire and returned to the sky again. Pundjel is said to have changed Toordt into Mars for his good deeds.

With the foregoing may be compared the legend of the Tasmanian Oyster Bay Tribe preserved by Dr. Milligan. Two strangers are said to have appeared suddenly and to have cast fire among the Tasmanians, and as the legend goes "these two are now in the clouds; in the clear night you see them like two stars (Castor and Pollux)." The resemblance between these Victorian and Tasmanian myths, little in itself, forms yet another link in the evidence for the relationship of the two races.

Mr. West observes† that a New Holland woman taken to Flinders remembered a tradition that her ancestors had driven out the original inhabitants, the fathers it is conjectured of the Tasmanians, but as the navigator could hardly be able to interchange ideas on such a subject with a native at that time, even with all the resources at his command, the story is of very little weight.

The Argument from Implements.

As compared with the implements and weapons of the continent, the paucity of these in the hands of the Tasmanians, the rudeness of the form and the inferiority of the workmanship suggest a difference of descent in the makers. But the lower skill of the islanders may be easily accounted for by the supposition that their progenitors had already reached Tasmania before the better equipped race had reached Victoria, and that after the first

* Mr. Brough Smyth's The Aborigines of Victoria, Vol. II., p. 460.

† History of Tasmania, p. 77.

settlement of the island, which may have been made when it was much more accessible than now, no further communication took place with the mainland. It is hardly fair to compare the weapons of the Tasmanian with those of the Australian, and from their dissimilarity to deduce absence of racial affinity in the owners, for the isolation of the Tasmanians reduced them to dependence for advancement on a very limited number of minds, and they may have made little or no progress after they crossed Bass Strait, whereas their kin on the mainland were overwhelmed by a race bringing with them superior art, which once introduced, only faint traces of the work of the primitive inhabitants might be expected to linger on. It is futile to ask, whether all the Australian implements are represented in Tasmania? If the implements of Tasmania be also found in Australia, although of improved manufacture, that should be sufficient to justify the theory propounded here in so far as the argument from such belongings has any force. The fact that certain weapons of the continental natives are absent from the island forms part of Mr. E. M. Curr's reasons for supposing that the Tasmanians were not of Australian descent, a method of reasoning which would lead inevitably to the conclusion that some of the Australian tribes were not of Australian descent.

For instance, neither the shield nor boomerang were known to the Tasmanians, nor were their weapons ornamented. But this ignorance is exactly paralleled by a people on the mainland. In Mr. Curr's own work* we read that among the Wonunda Meening tribe of Eyre's Sand Patch, "Shields and boomerangs are unknown, and their weapons are unadorned with either carving or colouring." This tribe also resembles the Tasmanians in being without the usual message stick. It is true that for arms the Tasmanian had only a plain spear and club but these are universal in Australia where the variety and more artistic make may be ascribed to the influx of a more advanced people and to the greater scope for and stimulus to invention on a territory so much more extensive and populous.

The club of the Tasmanians was pointed at both ends, and the part to be grasped was roughly notched so as to afford a secure hold for the hand.* This description would apply equally well to the common club or *kuthar* used by the blacks in southern Queensland which was entirely destitute of ornament. I mention this locality particularly, because I have accurate knowledge of the fact stated, and not because the plain weapon was only in use there.

Mr. Curr does not credit the Tasmanians with the ownership of a tomahawk or stone axe as others have done. They certainly

* The Australian Race, Vol. I., p. 395.

had a stone cutting implement, call it what you like, some specimens being beautifully finished as Mr. Brough Smyth testifies from inspection. It seems almost incredible that after the lapse of so short a time we should be unable to determine for certain whether the tomahawks of the Tasmanians had handles or not. There is some strong evidence that they had. Thus, *e.g.*, while Mr. Gunn says* "The tomahawks were held in the hand and under no circumstances as far as I know or can learn, were they ever fixed in any handle," a Mr. Rollings, in a letter addressed to Dr. Agnew, and dated 5th May 1873, says that in his youth he was constantly in the habit of seeing the aborigines of Tasmania and of mixing with them occasionally, and he affirms that their tomahawks had handles which were fastened to them in the same way as a blacksmith fastens a rod to chisels, being always well secured with the sinews of some animal.

But even if it be conceded that the Tasmanians used their axes without handles, the admission does not in the least invalidate the present argument as to their origin, for we find that the natives of the northern tributaries of the river Darling do not in all cases attach handles to their stone hatchets, but many use them in the same manner as the Tasmanians used their rough stone tools.†

It is of more consequence to note the difference in the mode of forming the large stone tools. In Tasmania they were always chipped to an edge, in Australia they were almost universally ground and polished. But even here exceptions in Australia indicate a former more primitive manufacture. The chipped stone tools of the Tasmanian are Palæolithic, while the usual ground ones of the Australian are Neolithic, but while only the one kind (Palæolithic) is found in Tasmania, both kinds are found side by side on the mainland, a state of things which indicates in the one case the existence of but one human stratum and in the other the existence of more than one. "If therefore," says‡ Mr. Brough Smyth, "all the stone implements and weapons of the Australians be examined, one set might be put apart and classed as the equivalents of those of the Palæolithic period of Europe, and another set as the equivalents of those of the Neolithic, a man of one tribe will have in his belt a tomahawk ground and highly polished over the whole of its surface, and not far distant from his country a people will use for tomahawks stones made by striking off flakes."

I cannot refrain from quoting here the same writer's conclusions based upon difference of arms used by the two peoples. "The

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* Mr. Brough Smyth's Aborigines of Victoria, Vol. II., p. 400; † p. 403.
† Mr. Smyth's The Aborigines of Victoria, Vol. I., p. 55; ‡ Intro. p. iv.

character of the weapons," he says* "made by the natives of Tasmania, the absence of ornament, their using their clubs as missiles and throwing stones at their enemies when all their clubs were hurled . . . . . indicated a condition so much lower than that of the Australians, that *one is not unwilling with Dr. Latham, to seek in other lands than those from which Australia was peopled for their origin.*" It is a pity that such a conclusion should have been expressed in a book which must always remain an authority upon the Australian aborigines, because it is altogether unwarrantable, inasmuch as the various marks of inferiority which characterize the Tasmanians are found here and there on the mainland. For instance, it has been shown above that in certain parts of Australia the tomahawks are used without handles and in other parts the shield and boomerang are unknown and the weapons are unadorned.

Mr. Smyth assumes that the Australians *do not throw their clubs*, but they do. The club was the proper weapon of the Kabi tribe of Queensland (as of others no doubt) for hunting the kangaroo, and they usually hurled it in the chase. And moreover, we are told that the natives of Cooper's Creek were in the habit of throwing stones in warfare. So that the logical conclusion to deduce from the arms of the Tasmanians is that they were of the same kind as those of the lowest of the Australians, and it is anything but illogical to infer that the autochthonous Australians once used exactly the same weapons and implements as those of the islanders but by circumstances which affected only the continent, the arms and implements there were almost universally improved.

One instrument, and a very important one, extensively used by the two nations has hitherto been overlooked as evidence of their kinship, I refer to the rope for climbing trees. It is hardly a mere coincidence that this rare and most valuable device should be found on both sides of Bass Strait. The material of which the rope was made differed in different localities in both countries, but the mode of use, and the skill of climbing by its aid were pretty much the same. Mr. West says† that by this means the Tasmanians ascended almost as quickly as with a ladder and came down more quickly. I have seen an agile black woman on the Bunya Mountains in Queensland, walk up a tall, smooth, perpendicular tree by the aid of the rope at quite a military quick march pace. In Tasmania the rope was made of kangaroo sinews or grass twisted, and handles were attached. At Twofold Bay in New South Wales the material of which it is made is the fibre of some vegetable, and here the rope is also provided with *wooden*

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* The Aborigines of Victoria, Vol. II., p. 401.

† History of Tasmania, Vol. II., p. 86.

*handles.** In some parts of Victoria it is made of stringy-bark. In the south-east of Queensland a tough vine is used, and I have even seen a very light ironbark sapling improvised for a climbing rope. The Tasmanians had also baskets like those of the natives of the continent, and the ovens so common in Victoria are said to be found occasionally in Tasmania.†

The Argument from Customs.

When we compare the customs we find a very marked resemblance, in fact it may be truthfully said that such customs as are universal in Australia were all followed in Tasmania. The dwellings of the two peoples were identical. Of the Tasmanians it is said,‡ "Their huts were of bark, half-circular, gathered at the top and supported by stakes." For houses they also made break-winds of boughs formed in the shape of a crescent with a fire burning in the open space in front, and near Pieman's River on the west coast of Tasmania, "one tribe was discovered living in a village of bark huts or break-winds of a better description than usual."‖ These notices form also a perfect description of the dwellings on the mainland.

The following practices were common to both peoples: initiatory rites to manhood, enforced abstinence from certain kinds of food, remedial bleeding, the wearing as charms the bones of deceased relatives, refraining from mentioning the names of the dead, laceration of the body by women in mourning, ornamental cicatricing of the bodies of young men performed (perhaps not invariably) by the women, exogamy, polygamy, burial in hollow trees, accumulation of skulls in cemeteries, carrying of sacred stones for the injury of toes and the benefit of friends, the obtaining possession of an enemy's hair to cause his death, knocking out one or more of the front teeth, ornamentation of the body with charcoal red ochre and pipe-clay, climbing trees by means of notches and also of a climbing rope, submitting to the penalty of receiving strokes from a club or casts of spears without self-defence as expiation of offences against the tribe, making the women beasts of burden and generally illtreating them, hereditary feuds, sketching living objects in charcoal, the hunting of kangaroos by firing the grass and intercepting retreat. This list of remarkable practices identical in both countries is surely sufficiently imposing to establish of itself, a very intimate, if remote connection.

It is a matter of dispute whether the Tasmanian knew how to produce fire, but Mr. Davies states that he was informed that

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* Mr. Brough Smyth's The Aborigines of Victoria, Vol. I., p. 151.
† Mr. Bonwick's "Daily Life of the Tasmanians," p. 19.
‡ Mr. West's History of Tasmania, p. 82.
‖ Smyth's "Aborigines of Victoria," Vol. II., p. 389.

they obtained it by rubbing round rapidly in their hands a piece of hard pointed stick, the pointed end being inserted into a notch in another piece of dry wood.* And an ancient ex-bushranger told Mr. Bonwick† that to produce fire the natives got two pieces of grass-tree stem, the smaller piece having a hole in it. "Some soft downy inner bark of trees was mixed with powdered charcoal and placed in the hole and friction with the other stick ignited this and produced a flame."

Mr. Curr‡ denies that the Tasmanians practiced the corroboree but there is abundant evidence that they did. Mr. Davies says that their chief amusement consisted in the corroborees or dances. Mr. Bonwick writes "The corroboree in the Tasmanian woods was very similar to that of the Australians, being chiefly by moonlight though by no means confined to that season. A great corroboree took place at the full moon of November each year."§ And Mr. Hill's more precise description of their singing and dances is well worth noting. "They sang," he says, "all joining in concert and with the sweetest harmony. They began, say in D or E, but swelling sweetly from note to note, and so gradually that it was a mere continuation of harmony; their dances are a mere wriggling motion of the hips and loins, obscene in the extreme." This description would apply exactly to some of the Australian corroborees and the abominable motions in dancing are also precisely like what is common in Australia, and, so far as I have heard, without parallel elsewhere.

Another example of the invalidity of reasoning from the absence of certain practices in Tasmania that were found on the mainland is the following from Mr. Curr's in many respects most excellent work. "The Tasmanians," he says, ‡ "neither skinned nor disembowelled animals before cooking, but laid them whole on the fire." In the same work we are told ‖ that the Muliarra tribe in Western Australia place the animal to be roasted on the fire whole and take out the entrails when it has been partly cooked. He continues "Fire was not made by friction of wood nor cannibalism nor circumcision practised." First rate testimony has already been adduced to the knowledge possessed by the Tasmanians of producing fire by friction. If we affirm that they were not cannibals we must base our opinion upon our ignorance rather than our knowledge, but even if they were not, we find in this respect a likeness between them and certain Australian communities, as for instance a very low tribe at Eucla in South Australia among

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* Smyth's Aborigines of Victoria, Vol. II., p. 408.
† Daily Life of the Tasmanians, p. 20.
‡ The Australian Race, Vol. III., p. 598; ‖ Vol. I., p. 376.
§ Daily Life of the Tasmanians, p. 38.

whom cannibalism was unknown.* The same statement holds good in respect of Australian tribes widely distant from this one, such as the tribe at the junction of the Lachlan and Murrumbidgee† and the Murraworry tribe on the Warrego River.‡ That circumcision was not observed in Tasmania is of no consequence to prove different derivation of peoples, for if it did, the argument would recoil on Mr. Curr by proving too much. It would split up the inhabitants of Australia into two races distinct in origin, for the observance of circumcision in Australia is limited to the people of a broad central belt crossing from north to south. Further on in this memoir the partial distribution of circumcision in Australia will be accounted for adequately. It is very clear therefore that the inferences based upon alleged dissimilarity of customs are of little or no weight, and especially when the numerous and striking points of similarity are taken into account. We may however with perfect fairness conclude that such peculiar practices as are common to the two nations have been inherited from the primitive Papuan Australians.

The Argument from Language.

The last and perhaps the most important class of evidence attesting the community of origin of the Tasmanians and at any rate one element of the mainland race is that offered by their language. Upon careful inspection the Australian and Tasmanian languages will be found to exhibit unmistakable resemblances not alone in phonology and structure but also in a considerable number of vocables. When one who has been accustomed to the dialects of Queensland and New South Wales begins to study those of Victoria he cannot help being struck with some entirely new features distinguishing the last-named. The Kamilroi, Wiradhuri and allied dialects are singularly fluent and melodious and free from harsh sounds. The initial and final letters are very limited, and certain combinations of consonants are abhorred. For instance in these northern tongues no word begins with 'l,' only one or two words with 'r,' and an odd one, if any, ends with 'k,' whereas all over Victoria and extending along the Murrumbidgee into New South Wales, a good many words begin with 'r,' and the initial 'l' and final 'k' are quite common. This is a most conspicuous difference which as you travel southward is met first about the Reed Beds on the Lachlan a little above its junction with the Murrumbidgee. If a geologist in tracing a bed of limestone finds it suddenly transformed into marble he is sure that metamorphic fires have been at work, and just as reasonably does

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* The Australian Race, Vol. I., p. 402.
† My informant is Mr. Humphry Davy.
‡ My informant is Mr. William Shearer.

the philologist conclude the former interference of a powerful disturbing cause when he finds at a particular line a sudden change in the genius of a language. The proximate cause of the difference just noted appears to be a more decided residual Papuan element in Victorian speech than in the dialects further north. Of the latter let the Kabi dialect of Queensland, spoken in the Bunya Mountains, stand as a special example. It has no word beginning either with 'l' or 'r.' Its terminal letters are limited to 'l,' 'm,' 'n,' 'r,' 'ng,' and vowels. In general it may be said that such combinations as 'bl,' 'br,' 'gr,' common enough in Victoria, are of very rare occurrence in the north. An examination of the scanty remains of the Tasmanian speech shows that it is characterized by initial 'l,' initial 'r,' and final 'k'; 'kl, 'pl,' and 'bl,' 'kr,' and 'dr,' 'rt,' and 'rk,' are common Tasmanian unions and not infrequent in Victoria while they are of comparatively rare occurrence in other parts of the continent. Where, save in Victoria, would such forms be found as 'grangurk,' *a hill*, 'ngurnduk,' *teeth*, 'kroombook,' *breasts*, 'kraigkrook,' *mosquito?* with which compare Tasmanian 'crougana,' *aloft*, 'krangboorack,' *ripe*, 'neoongyack,' *rage*, 'crackaneeack,' *ill*.

In fact it is obvious beyond any question that while we discover positive Papuan (Tasmanian) lingual traces in most parts of Australia, with slight exceptions they are more distinct on the coast than inland, more strongly marked on the west coast than on the east (north of Victoria), and they are most abundant and most conspicuous in Victoria, proving without a doubt that the Victorian dialects inherit a powerful base of the primitive Papuan or Tasmanian language, and leading to the conclusion that *the Tasmanian speech crossed over from Victoria.*

The most remarkable negative features of both the Australian and Tasmanian tongues are the absence of sibilants and of the decided palatal 'ch' and soft 'g.' The fact is not overlooked that some writers have introduced an occasional 's' or 'z' into Australian orthography as others have into Tasmanian, but the rarity of these in both cases is so extreme as to be phenomenal, and sometimes rather attributable to the ear of the hearer than to the tongue of the speaker. I am aware that many spell Australian words with 'ch' and English 'j' or soft 'g,' but the sounds thus represented would, it seems to me be more perfectly written as 'ty' or 'dy,' the 'y' having its consonantal English value. Thus instead of 'cha,' it would be more like the native pronounciation to write 'tya,' alternative modes often met with, and instead of 'polaich' or 'polaitch' it would be more accurate to write 'polaity,' the 't' and 'y' coalescing. The only sound in the Tasmanian speech which with any show of reason can be said to be wanting in the Australian is the guttural 'ch' to which Mr. Curr adds the

French 'u.' As these are the only two sounds adduced by Mr. Curr as indicating dissimilarity of phonology and forming part of the evidence of alienation of blood, it may be observed in reply that the French 'u' to most English ears varies with the ear, and that among the Australian aborigines there are peculiar modes of enunciating certain obscure sounds which have never been represented on paper. I have heard in Queensland a terminal combination of 'iu,' which some would call a French 'u.' But so subtle a variation in the pronunciation of a vowel might only be provincial, just as in some parts of the Lowlands of Scotland the French 'u' is found and not in other parts, although the people throughout are of the very same stock and speak the same language.

The foregoing considerations tending to weaken the force of an objection are superfluous when it has been already rebutted and demolished. The argument based on the absence of this sound in Australia is completely nullified by the statement of Mr. Schürmann* that "*the aboriginal language requires sounds like the French* 'u' *or German* 'ü'." An opinion evidently shared by another German, a member of the Roman Catholic Mission at Port Darwin, who has favoured me with a vocabulary of the Larrikeeya tribe in which he employs the German vowels 'ö' and 'ü.' The guttural 'ch' is certainly very rare in Australia, but singularly (perhaps I should say naturally) enough we are told that it is used in Victoria and on the south-east border of South Australia. On the Upper Richardson 'h' a closely related guttural was sounded† clearly and sharply like 'r.' Mr. Hartmann says of the Victorians that the 'h' of the third person plural scarcely expresses the sound it is meant to express, the 'ch' should be pronounced as the German 'ch' in *ich*, *mich*, *sich*, and the Rev. Geo. Taplin says that 'h' was sounded clearly and sharply among the Narinyeri on the Murray River bordering on Victoria.

Unfortunately for a comparison of syntax and general structure no Tasmanian grammar was ever compiled, so that we can only base inductions upon the few brief dialogues and meagre vocabularies that have been preserved. However from these we glean the following points of resemblance to Australian syntax, ideology and word structure. Both languages have the trick of introducing — or as the case may be eliding — the letter 'g' when occurring within a word. The Tasmanian, modified by post-positions, the usual, though not the universally invariable Australian manner. The Tasmanian dialects had no article, and expressed neither gender nor number by inflection or agglutination, a remark which

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* Parnkalla Vocabulary, p. 2.

† Smyth's Aborigines of Victoria, Vol. I., p. 3.

is generally true of the Australian dialects. The Tasmanian numerals were limited to one, two, three, four and five in the most copious dialects, the terms of the mainland were often enough limited to one and two. By which is not implied that the particular tribes could count no higher than the number of their highest numerical term, but that numbers above that term were expressed by combinations of the lower terms. Among the Tasmanians some tribes had numerals for one and two only, in which case the numerical system must necessarily have been binary, but others had distinct terms up to five inclusive. One form however which is given as the equivalent of five seems to be a repetition of the term for *one* along with the term for *four*, this is the view which Dr. F. Müller takes of 'puggana marah,' and which I am disposed to take, but it is not affirmable absolutely. The common Australian system is binary.* but distinct words for three and four are met with in many places, a proof of powerful disturbing causes. The Australian system being binary, we should expect to find resemblances in both tongues between terms for *one* and *two* only. The Australian term for *two* is generally 'boola' and is without doubt the same word as the Tasmanian 'bura' or 'boula' or 'pooalih.' We cannot so certainly affiliate the words for *one*. As we have seen, the Tasmanian radical is 'mara,' the Victorian seems to be 'kaiap' which being represented by 'kain' in Western Australia is no doubt a very ancient Australian form, but there are not wanting hints of a possible synchronous or antecedent Australian term for *one* with stem 'mar.' Thus in the Kamilroi speech the word for one is spelt 'mal,' 'marl,' 'mahl.' Among the Wiradhuri a closely related people, one form is 'mugo' 'miko,' about the Hunter it was 'mumaan,' at Wollongong and neighbourhood 'mittung,' at Moneroo 'boor,' 'mittong,' 'mivan.'

The nearest agreement with the Tasmanian is found in the north of Queensland where the following are terms for *one*, 'mooraroo' on the Hamilton, 'murima,' 'mirina,' 'marrar' at the junction of the Barcoo and Thomson. At the Lower Diamantina 'orroo' is the term for one, but 'barkoola-marna' (2 + 1) stands for *three* proving the existence of 'marna' as an ancient form for *one*. The etymon of these northern terms is manifestly 'mara' the Tasmanian radical. In Victoria there occurs the following sequence of enumeration† 'kiappa' (one), 'polija' (two), 'politmea' (three), the term for three is variously spelt 'pollimia,' 'pulemir,' 'pulemeir.' From the genius of the language we readily infer that 'politmea' and variants are equivalent to 2 + 1, and that

* The writer is aware that some natives count at least twenty by means of the terms for fingers and toes after the ordinary numerals have been passed.

† Curr's The Australian Race, Vol. III., p. 490, *et seq.*

therefore 'polit' representing two, 'mea' or 'mir' may be the trace of a term for one older than 'kaiap' or cotemporaneous with it. And the Australian examples when combined strongly favour the presumption that the Tasmanian 'mara' the stem of the term for *one* has a corresponding form on the continent.

The Tasmanians had such expressions as *legs-long* for *tall*, and they characterized certain affections whether of the body or mind *e.g.*, fear, hunger, fondness, &c., by names which indicated their effect upon the stomach or the eyes: features also of Australian speech. Another character common to both languages is the evident relationship of the terms for *eat*, *stomach*, *excrement*, and *ground*, the names for which appear below. It is common in Australian dialects to find the same word applied to *head* and *hill;* it seems to me that there was in one or two Tasmanian dialects the same idiom. The Tasmanians used diminutives, as for instance 'pugga,' *a man*, 'puggetta,' *a child*. We are told by Mr. Curr* that diminutives were very common in the dialect of the Bangerang (Victorian) tribe.† Reduplication was a feature of both languages though more general in the Australian, perhaps owing to its occurrence in Malay as well as Papuan speech. In both Australian and Tasmanian it was sometimes used to form the intensive mood like the Heb. 'qᵉtaltal' or 'pᵉ'al'al' cf. Tasmanian 'telbeteleebea' *to eat heartily*, from 'tughlee' *to eat*, and Australian (Kabi, Queensland) 'yeleliman' *to speak quickly*, from 'yeli' *to shout*, from 'ya,' *to speak*.

There is a feature of Victorian dialects which should not pass unnoticed; in several of them the first and second personal pronouns depart from the usual Australian (Dravidian) 'nan-nin' type a circumstance which supports the presumption of a strong disturbing element having been at work in Victoria. When we come to compare particular vocables we find certain ancient forms cropping up in places very widely apart in Australia, a few fossils of an older stratum continuing in one more recent. The prototype of the modern Tasmanian is undoubtedly the stratum of which they are surviving representatives. While we may pick up one specimen here and another there all over the continent, just as in the case of other features we have noted, by far the largest number of words which are identical with Tasmanian forms or incontestible variants of them are to be found in Victorian dialects.

In the following comparisons the English word is usually the exact equivalent of the Papuan, but sometimes it is the general idea at other times the etymological idea of the root in which cases

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* The Australian Race, Vol. III., p. 569.

† I find that the Australian dialect most like Tasmanian in terminations is that spoken about the junction of the Darling and the Murray. The verbal terminations are in this case practically identical.

the particular meanings of the Papuan (Australian and Tasmanian) words are expressed. These analogies show how remarkably the old language protrudes through the modern Australian like the primary rocks in mountain regions piercing through the aqueous formations. The first table exhibits Tasmanian words which are widely diffused in Australia, some of them appearing in places only at great distances apart, and being unknown in the intervening space.

TABLE I.

English.	Tasmanian.	Australian.
Ground or earth	gunta, gonta, coantama ... (This may correspond to the Australian gunna or gudna the common word for excrement.)	nguntha (De Grey River); kuntha, *grass*, (Cooper's Creek); thagound (Barnawatha); dagoon (Wellington); dha or tya (Australia generally),
Excrement ...	tiamena, tiannah, tyaner ...	nguntha (De Grey River); gunda (Shark's Bay); dagga (Bogan); duggan (Warren); thugga (Waljeers); gunang, gunna or gudna (Australia generally).
Foot	pere *	mamberie (Lachlan and Murrumbidgee Junction); piru, *thigh*, (Hopkins River, Victoria); pur-ring, *knee*, (Lake Tyers, Victoria); piri, birri, birring, bret, occur as *nail*, *finger*, *hand* or *footprint*.
Eat	tuwie, dodani, tuggana, tegurner.	dha or tya (general).
Two	bura, boula, poolih, piawah ...	boola (general).
Mouth ..	kakammnah, kaneina, canina, canea.	gaal, kaat, kanek, korn, cone, (all Victorian); knine (Waljeers); ngang (Deniliquin). These may be regarded as all embraced in one Papuan region, viz., the Victorian.
Fire	une, wighena, wimmaleah, weenar, *wood*.	wi, win, wee, ween, (general).
You	neener, neena ..	indu, ngindu, (general). Introduced here, but the writer regards this word in its usual Australian form to be Dravidian.
Smoke ...	prooana, boorana	boort (Victoria); pooya, (Streaky Bay) bwoya, boyer (Western Australia); pooyoo (common).
Tongue ...	tullana	tallan, tyelling (general).
Nose	mudena, minarara, moonar, manewurrar, mununa, muggenah, muye, muanoigh. (The common element is 'mu.'	muntyin (Princes Charlotte Bay); moolya, moodla, moolla, mooroo, (all common). The persistent element also 'mu.'
Thigh... ...	tula, trungermarteener, teigna	dhirang (general).
Walk	yange (in Milligan's Dialogues)	yango, yanga, yan, (general).
Speak .. .	oona (in Milligans Dialogues) oana, oangamah, *inform, tell*; oghnemipe, *to answer*; oghnamilee, *to ask*.	wangow (Swan River; wangondi (S. Australia).
Water ..	mookaria, moga, moka, mocha, mookenner; moonghenar, *urine*, mungana *urine*. I would ask special attention to this analogy as being perhaps the most remarkable of them all. Just imagine two peoples perfectly separated for many centuries and without writing, yet retaining a word of	mokkera (Murray and Darling Junction); mukkara (Torrowotto Lake) muckaria and mugair (Lachlan and Murrumbidgee Junction); moogaban (Alice River); mookorar (Port Macquarie); maicheri (Piangil); mittuk (Lake Boga Victoria). All these Australian words are terms for *rain*, but their identity with the Tasmanian analogues is perfect and terms for rain and water re-

TABLE I.—*(continued.)*

ENGLISH.	TASMANIAN.	AUSTRALIAN.
	four syllables in forms so precisely alike that even foreigners independently can spell the word 'mookaria' and 'muckaria.'	spectively are often interchangde among Australian dialects.
Bosom or breast	paruggana *(a woman's)*, parrungyenah *(a man's)*. To these may be added the first syllable of proogwallah, a word meaning *milk*, and probably literally *breast-water*; if so, 'wallah' has an equivalent in Australian 'walla' or 'wolla,' common in New South Wales for *water* or *rain*.	birri *man's breasts*,(Kamilroi Dialects) birring (Healesville Vict.); brim brim (Mordiyallock Vic.); birrin (Warren N.S.W.); beergin (Forbes and the Levels, N.S.W.)
Fly	monga, mongana, mounga *fly-blow*, also *to buzz*.	mookine, mugguing (on Culgoa River N.S.W.); moongin, muggin, mogan &c., forms for *mosquito* in Kamilroi; mungi *mosquito* (Piangil); moaing-moaing *mosquito* (Kulkyne); mianong, myanga *fly*,(about Port Jackson); kerramongera *fly*,(Gippsland) moneya *mosquito* (Omeo); miangan *fly* (Omeo).
Come	tutta watta, todawadda (*come here*).	waarta (Lake Hindmarsh, Victoria); woti (Talbot, Victoria); ouarto (S. Australia); now-wunty, *Come on*, (Gippsland); wotte, wurte, *come on* (The Glenelg, Victoria); kakawattake, *come on*, (Hopkins River Victoria); kowatha, *come on* (Cooper's Creek); wat, watto, *away, off*, (W. Australia).
Shout... ...	palla-kanna (kanna means *to make a noise*).	curn-deeo (Mount Talbot, Victoria); kurnda (Swan Hill, Vic.); kanyandiga—ganyanda, *to call*, (Lower Goulburn, Viet.); garnda, coerndee (Lake Hindmarsh, Vic.); kinda *to call*, (Mount Rouse, Victoria).
Eye	namer-eca, nam-mur-uck, nubreah, mongtena, moygta.	mir (common Australian form); numuru (Daly River, Territory). For Victorian forms see Table II.
Arm	wornena, wu'hnna, gouna, houana, wayeninnah, *elbow*.	wooruk (Mount Rouse, Vict.); wing, (Upper Murray, Victoria); wunyea (Lower Murray, Victoria, also on Darling and Murrumbidgee); wurt (Lake Hindmarsh, Vict.); whoornang *forearm*, (Lake Tyers, Vict.); wornick, *forearm*, (Maryborough, Victoria); oona (Mount Freeling to Pirigundi Lake, S. Australia).
Sun	loina, loyna	laong, laank, *eye*, (between the Lachlan, Murray and Darling, N.S.W.); arlunya, *sun*, (Alice Springs Telegraph Station, S. Australia); alunga, *sun*, (Charlotte Waters Telegraph Station, S. Australia). The initial syllable ('ar,' 'al') may be disjoined, the introductory vowel being a local trick of language.

* The introduction of this analogy is justified by the following considerations. In the Tasmanian Vocabulary compiled by M. H. de Charency, 'pere' is given as a word for foot used in the south-east of the island. Along with which are given 'perelia' and 'pereloki' *toenails*. The words 'perring,' 'paring,' and

variants signify *footmark* in west and north-west of Victoria. In sandstone caves* on the Cape River in Queensland, there are red impressions of hands which the blacks call 'beera,' although the local word for *hand* is 'buka.' The word 'beera, (or words almost identical) still signifies *hand* or *fingers* in the south of Queensland, on the Bogan River in New South Wales, and in Gippsland, Victoria. As the same word is used in places for *breasts* I am inclined to think that the root 'bir' or 'pir' originally meant any protruberance or extremity, and became specialized for such members as hands, feet, toes, fingers; &c.

In presenting the Victorian-Tasmanian analogies, which are very numerous. embracing nearly all the words of the preceding table and including many more, I place in the front those having 'l' as the initial letter. This was the class of analogical words which first arrested my attention. As initial 'l' was a notable feature of the Victorian dialects distinguishing them from those of New South Wales and Queensland and was also a peculiar feature of the Tasmanian language I surmised that a common lineage was the reason for this likeness. After comparing all the Victorian words beginning with 'l' obtainable by me with Tasmanian words having the same initial, I find so large a number in the one set, evidently identical with words in the other as to be very surprising, especially when we think of the length of time which must have elapsed since the lines of language divaricated. I have therefore come to the conclusion that Victorian words with 'l' initial are lineal descendants of the primitive Papuan.

It is one of the recognised tests of the truth of a hypothesis that it opens the door to facts other than what was first discovered by it. This test can be applied to verify the hypothesis here enunciated regarding this class of words having initial 'l.' By its means I have discovered that at least in Australia, and perhaps in Tasmania, 'l' and English consonantal 'y' have been at one time confused and perhaps coalescing and interchangeable sounds.

Prof. Max Müller gives† some instances of the "confusion between two consonants in the same dialect" which he regards as a characteristic of the lower stages of human speech. There seems to have been a very ancient confusion of this kind between the powers of 'l' and consonantal 'y' in Australia. English 'y' or 'i,' when consonantal, may very easily through defects of hearing or utterance be confused with 'l,' and the two sounds are to the ear closely related. Examples are common enough. Compare the Indian corruption of Les Anglais to Yankee, such forms as Italian 'piacere' for Latin 'placere,' and the French pronunciation

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* Curr's, The Australian Race, Vol. II., p. 476.

† Max Müller, Lectures on the Science of Language, Vol. II., pp. 188-9.

of such combinations as 'eille.' That in Australo-Papuan speech 'l' and consonantal 'i' have been confused, the following examples will make sufficiently clear. In western and north-western Victoria such forms as these prevail as equivalents of *black woman* 'leyoorook,' 'leurook,' 'liarook,' 'leyoor,' 'lioo,' which may be compared with 'yewa' (Cooper's Creek), 'yooratoo,' (Unyamootha Tribe), and the following forms found in Western Australia from Perth southwards, 'yokka,' 'yooko,' 'yawk,' 'yorka,' 'york.' The next example is a word which throughout the greater part of Victoria begins with 'l.' It is the term for teeth and the following are typical Victorian forms 'lianyook,' 'lea,' 'liia,' 'leor,' 'leurn,' with which compare such forms as 'yira,' 'ira,' 'eera,' 'yeera,' very widely distributed throughout Australia except in Victoria. It is interesting to note that with over a thousand miles of country intervening in which the 'y' type prevails, the Victorian and Tasmanian type in 'l' turns up again at Caledon Bay on the Gulf of Carpentaria in the word 'lerra,' perhaps indicating the persistence of a Papuan pronunciation due to a backward and northward eddying of the Papuan speech.

Then further, as the word for *stone* we have in Victoria 'larr,' 'laa,' 'la,' while on the Murray the same word is represented by 'yarnda,' on the Lower Bulloo River and at Yelta by 'yernda,' and in the Woolna language again in the far north-west the form 'lunga' occurs. A similar word in some places is used for *camp*, assuming such forms as 'larrh,' 'larrer,' 'lerra,' which even in Victoria is represented by 'ira' at Lake Hindmarsh, 'iray' at Tatiarra, and by 'ieera' at the Gawler Range in South Australia. The same interchange of 'l' with 'y' is observable in certain terms employed to designate *skin*, *bark*, and *canoe*; 'look' and 'looko' are words for *skin*, 'long' and 'laikoti' for *bark*, 'longoi' and 'longwe' for *canoe*, with which compare 'yangoibi,' 'yongoe,' 'yoongoip,' 'yungoot,' all meaning canoe. It should be observed that by a radical or natural metonymy *skin* and *bark*, *bark* and *canoe* are frequently expressed by the same word. The original unity or early confusion of the letters 'l' and 'y' is illustrated by several words meaning thigh, *e.g.*, 'langui' at the mouth of the Leichhardt River, 'lar' at mouth of Norman River, 'yungurra' at Porter's Range, 'yangara' at Upper Flinder's River, 'yungera' at Cape River. The most interesting of the above examples are the words for *blackwoman*, *stone*, and *teeth*, which serve as a kind of bridge for crossing to Tasmania, or as links to unite a particular class of words there with their continental variants, and to widen the field of comparison while they ensure the validity of the operation.

Before leaving this class of words we may ask the reason for these letters 'l' and 'y' being interchanged. Is it owing to an

original indistinctness or confusion of articulation? Is it due to later defective pronunciation when perhaps foreign tongues have come to attempt initial 'l'? This much seems certain that initial 'l' was a feature of the original Australian speech as represented by Tasmanian dialects, by those of Victoria and various other parts of Australia frequently widely separated. But a characteristic of Tasmanian is the occurrence of 'ly' in conjunction at the beginning of a word, evidencing perhaps an ancient undecided sound which became differentiated and fixed into 'l' and 'y,' let such words as 'lyenna' *kangaroo*, 'lyinneragoo' *to forget*, 'lyeninna' *eyebrow*, 'lia' *water*, serve as illustrations. A Victorian example is met in 'lyarook' *a woman*. The case of 'y' being thus affixed to 'l' is I think just a particular instance of a feature of Tasmanian phonology not uncommon in Australia, viz., of what might be called the furtive 'y,' for this letter steals in very frequently after 'l' 't' and 'n' especially, forming *mouillé* consonants.

I shall begin the comparison of Tasmanian and Victorian words with the particular class which first suggested their relationship to me, the words with initial 'l.' Why should this class of words be a phonological peculiarity marking a group of dialects in south-eastern Australia. spoken in a tract of which the northern boundary almost coincides with the Murray? Why should this group of dialects be hedged round landward by others distinguished by the absence of this very peculiarity? Why should words of this orthographic character exist plentifully in Victoria and be comparatively rare in most other parts of Australia, save in the extreme north-west and about the Gulf of Carpentaria? Why in Victoria and be also a pronounced feature of the Tasmanian tongue? Why I ask, unless there linger in Victoria evidences of the most recent Papuan influence as compared with other parts of Australia and sure proofs of the Tasmanians having had a closer affinity to the Victorians than to the rest of the Australian natives.

It might at first sight be doubted whether the common Victorian word 'layarook' or 'lyarook' and other variants is the same as the general Tasmanian word 'lowa,' both sets of words meaning *woman* or *black woman*, but fortunately the Victorian word has retained the form 'laua' in Gippsland which being phonetically identical with the Tasmanian word establishes beyond the possibility of a doubt, the fact that the words for *woman* (sometimes *wife*) in both languages are the very same. Without dwelling further on particular words, I append a list for comparison and in order to indicate as near as may be known the root form and to show the direction of divergence I give a number of variants from both sides of the strait. The English word, as before, represents the general or etymological idea of the root being also usually the exact equivalent of the native word in both columns, and the

native words with a few exceptions will be found either in Mr. Curr's or Mr. Brough Smyth's work.

TABLE II.

English.	Tasmanian.	Victorian.
Woman... ...	lowa, loa, loalla	lio, laua *wife*, (Gippsland); leyoor, leirock, layarook, loangko, *a wife*, (Lower Murray).
Teeth	leeaner, yanna; leeanner *to bite*;	lia, lear, leeunger, leanook.
Stone	longa, lonna, loine, larnar ...	long *a cliff*, lang, lak, laugh, lar, laa, cf. also wollong or wallung common in New South Wales. ['lung' is a common word for stone in Central India whatever inferences the fact may involve.]
Open or cut ... [The members of this group of words, are almost certainly derived from one or other of the two preceding groups.]	leeang wellerary, leearway, laini *to untie*; lowgoone *to cut*; larre *to scratch*; lowoone *to scarify*; lergara, leawarina *to flay*; liellowullingana *crevice* or *fissure*.	loong gonak, *to divide*; larl-groo-war, lal-go-mak *to split*; Lal Lal, probably *Great Rift*. [With this class of words compare 'lalingander' *axe* a word used by the Woolna Tribe near Port Darwin.]
Home, house, nest, camp.	line, lenna, liena, liee	laangy, langi, lar, larr, larnoo, lingi.
To sleep ...	loagna, logurner, lony	loomai (Woodford); loomia (Dartmoor); cf. also yooanan.
Tree, stick ...	loyke, loatta; lottah *gum tree*; lerga and lerina *waddy*.	lang; loang, *little tree*; lordwill, lurt and lead *stick*.
Top or point ...	lyetta *sharp* or *peaked*; letteene *a peak*.	lit, *point*; littia, *sharp*; litwong, *to sharpen*.
Serpent... ...	loieua, lounabe, loina; lollah *earthworm*.	loowa birri *wood snake* or *constrictor*.
Leg	luggra, leurina, lurerener, langana; lure *ankle*; lugh *foot*.	lourko, lourt-am-nook; lourk, *calf of leg*.
Coal, charcoal	loarra, loira	louru, (Gippsland).
Water	lia, leena, legana, lerui, line; liapota *creek*; loyuleena *spring*; lyaleetea *sea*.	larra, lajeranyen, *spring*; loortowi, loortokal, *creek*; Leaghurr, Lalanguite, names of Lakes]; ludlut, lowtoohk, *river*; lamat, *sea*; lakulang, *salt lake*; cf. also yallock, a common word for creek.
Child	leewoon; looweinna *children* luena, leuna, ludawinna, *boy*; ludining *girl*.	lathe; leed, *boy*; leech, *son*; lunden, lunduk, landhagonert, latingata, *sister*.
Big	langtha; lackrana *great* ...	leengil.
Man, blackman	pugga, pah, penua (*Capt. Cook*) beah.	baang, peang (Central Victoria.)
Kangaroo ...	terrar, tarrana, tarrleah ...	tirrar, tyirra, jirrah (all in Gippsland)
Mother	pawamena, pamena, parmeny	bawain, parbine, baabin, parbuk, paab, paapa, papay, papi.
Opossum ...	wollimerner	wollert, wolard.
Head	poyta, poiete	poibi, poko, pooruk, pork.
Mouth	kaneina, canina, canea	kanek, koorn, gaat, cone.
Lips	wurlerninner	werrong, wuro, woortogno, wooro, (common for mouth).
Eye	namer-eca, nam-mur-uck, mongtena, moygta (initial syllable 'na,' probably connected with Australian root 'na' to see).	mirrenyook, mirnook, mir, mynook, mingi, myng, mooeh, mirnik, [termination 'ook' may be sign of possession.]
Ear	wayee, wegge	wooring, wring, wing, weinyeduck.
Thigh	(*a*) tula, teigna, trungermarteener. (*b*) kaarwerra.	(*a*) djereng, dering; (*b*) kaar, karingatuk, karnook, kaarchuk, karip.
Foot	tyentiah, teeantibe *to trample*, i.e. *to foot*.	tyenna, tyain; tey-yan, *foot* or *footmark* (Gippsland).
Blood	coccah	cookyangerack, gooak, koorkook, krook
Fire	une, ouane, wighena, winnaleah	wee, weiu, weeing; wying, *light*; [prevalent also out of Victoria.]

TABLE II.—(*continued*).

ENGLISH.	TASMANIAN.	VICTORIAN.
Wood	gui, weenar; weegeena *dead-wood*; weena *tree*; wiena, winna *firewood*.	ween, we, wing, [presumably *firewood*]
Smoke	boorana, prooana, progoona; boora *rain*.	boort, booring, poorin; boorang, *fog*: boorrarrang, *mist*.
Moon	weeetta, weethae, vena, weena; tooweenyer *sun* or *moon*.	huera, wana, waingmil, wyngwil, waing wyrng, *light*; ngiweu, noween, noweyo, *sun*.
Grass	poene	poou (Omeo); booite, boott.
Knife or flint ...	teeroona, trawoota	teer, deer, tirr, taree, all meaning *tomahawk*.
To eat	tegurner, tuggana, tuwie ...	tunganeit, tukkali, thangarth, thaange thana; [most likely co-derivatives with 'dhangga' a common Australian word for teeth.]
To go	tawe; tangara *go on*; tagara *go away*.	toewangeit ['-eit' verbal termination] tanna toa, *go away*; tanna, *go*, in phrase 'tanna noul?' *will you go with me?*
To walk... ...	yange *they walk* (in phrase 'yange menaye' they walk along the river: in Milligan's Dialogues).	yangan, yannonan, yanga, yanua.
Stomach ...	ploner, plaangner	polloiu, belanyin, ballingek, boole, beleni, belangee (Lachlan and Murrumbidgee Junction).

A few of the foregoing analogies may not seem to be sufficiently established, but even if ten per cent. were to be discredited for want of certainty, a great array of obvious ones would still remain to attest the kinship of the two languages. A brief notice of two or three more Tasmanian words may be helpful to relate the two forms of speech. In Tasmania there are two general but widely dissimilar classes of appellations for the kangaroo, one represented by such terms as 'lyenna,' 'lathakar,' 'leigh,' 'lurgu,' the other by 'terrar,' 'tarrana,' 'tarr.' The former class seems to be connected with one of the Tasmanian sets of terms for *leg* or *foot* exemplified by such words as 'luggana,' 'lugh,' 'leoonya,' 'luggra,' 'lathananna,' I have been unable to discover any similar word for kangaroo on the mainland except 'langootpa' at Port Darwin, and 'loityo' at Caledon Bay on the Gulf of Carpentaria. The one set of words for kangaroo being almost identical with the terms designating the organs of locomotion, it seems pretty certain that either from superior power in the use of these or for the long measure of them which the kangaroo is endowed with, the animal received its name. And it seems at least probable that the 'l' words for *leg* and *kangaroo* in Tasmanian are related to the universal Australian word 'yanna' or 'yango' *to walk*, for which the form 'lingo' is said to occur in Victoria.* It has already been shewn that both in Australian and Tasmanian speech 'l' and 'y' when initial have often been confused.

* Smyth, The Aborigines of Victoria, Vol. II., p. 127, phrase, Where are you going?

The words 'locko' *foot* in use at Caledon Bay, 'langiu' *thigh* used at the mouth of the Leichhardt River, and 'lar' *thigh* at the mouth of the Norman on the Gulf of Carpentaria, are curious relics of the original terms for either the motors or the motion, and reach without other connection right across the continent southwards to claim kin with their Tasmanian friends having initial 'l.' This line of argument is powerfully corroborated by the occurrence of the following terms for *thigh* in Queensland, 'yungurra' at Porter's Range and Walsh River, 'yangara' at Upper Flinders River, 'yungera' at Cape River means *lower part of leg*. At Menindie 'yango' means *left thigh*, and 'yalko' is the word for *thigh* on the lower Paroo, the Warrego, and at Weinteriga on the Darling. All these are evidently enough the local equivalents of 'langiu' used at the mouth of the Flinders River. What if 'yan' *to go* be a related word. If so, the term 'yungar' or 'youngar' applied to *kangaroo* throughout the greater part of Western Australia may be cognate. Perhaps it may be too fanciful to pass northwards to Java and connect the foregoing words with Javanese 'laku,' 'lunga,' 'lingar,' *to go*, but the likeness in sound and meaning is very tempting.

The affinity subsisting both in Australian and Tasmanian between the terms for *ordure*, *intestines*, and *ground*, cannot fail to force itself upon the investigator's notice. The words are given in the tables above, and when compared they lead to the conclusion that they are inter-related in both regions, the common element being 'ta' or 'tia.' Alongside of these may be placed the radical part of the words meaning *to eat* 'tegurner,' 'tuggana,' 'tuwie,' (Tasmanian) 'tunganeit,' 'thaange,' 'dha,' 'dhoman,' (Australian) and perhaps the very prevalent Australian word for *teeth* 'dhangga' with variants. This last word may be onomatopœic and the other vocalics may narrow down to two roots, perhaps only related in likeness, one meaning *to eat* the other *ground*. Another class of related words in both languages and forming all together a group of related words are the equivalents of sun, moon, light, fire, eye. In both languages the radicals 'na,' 'mir,' 'wi,' the etymological ideas of which are respectively *see*, *eye*, *fire*, are combined in numerous ways, making such compounds as see-fire (*sun*), see-eye (*eye*), fire-eye (*moon*) and the like. With these may be compared a second set of words for *eye* and *sun* taking the form of 'loina,' 'lunya,' and the like also occurring in the language of both peoples.

Mr. Hyde Clarke has endeavoured to show* the affinity of the Yarra Dialect with those of Mozambique, and later Mr. E. M. Curr assays to prove the kinship of African languages generally

* The Yarra Dialect and the Languages of Australia in connection with those of Mozambique and Portuguese Africa. Transactions of the Royal Society of Victoria, Vol. XVI.

with those of Australia and Tasmania. Physical characteristics alone would suffice to obtain acceptance for Mr. Huxley's view that of all races the Papuan is most nearly related to the African. And besides physiological considerations, certain practices and superstitions common to the Australians Tasmanians and Africans, point to identity of ancestry at some far distant past date, but the verbal analogies adduced are rather shaky props on which to rest the relationship argument. Mr. Clarke avowedly discards as Mr. Curr does tacitly the testimony from grammatical structure, and they both present merely phonetic resemblances which may be very misleading as the following considerations will show.

In the first place there is a number of vocables which may be looked upon as universal whether they be of onomatopœic origin or no does not affect the present argument, but the words are as much European or Asiatic as they are African and Australian. They occur as equivalents for father, mother, breasts, milk, teeth, tongue, eat, go, and are such roots as 'ba,' 'pa,' 'ma,' 'ta,' 'yo.' Further, the possibilities of speech are limited, all races have virtually the same vocal instrument, and there is I believe in mankind generally an inherent capacity to name things according to the subjective effect which the observation of them produces, giving good grounds for recognizing the ding-dong theory as partially (and in large part) accounting for the origin of language. And therefore, if phonetic likeness alone were to be taken into account a very good case could be made out for the descent of the Australian speech from the English or *vice versa*, especially if when the English dictionary failed we might call in the aid of any language on the continent of Europe to supply the deficiency, and indeed for such a comparison all the Indo-European languages might be regarded as one family. The subjoined short list will show the feasibility of proving the descent of Australian languages from English.

Etymolggical Idea.	Australian Words.	English Words supplemented by European generally.
Father... ...	papa	papa.
Mother ...	amma	mama.
Breasts ...	ama	mammæ (Latin)
Head	kam kopul ...	caput (Latin); kopf (German)
Teeth	dhangga	teeth; dentes (Latin); odontes daknō *I bite* (Greek).
Go	yan	eo (Latin); gehn (German); gyaun (Scotch).
I	ngie, ia	ego (Latin); I.
Boy	lathe	lad; laddie (Scotch).

With some two hundred dialects to draw upon in Australia and dialects innumerable in Africa, it would be strange indeed the possibilities of human speech being limited, if close coincidental

resemblances were not discoverable here and there in the compared regions among appellatives for the same object. There seem to be no solid reasons for deriving the Tasmanians and Australians independently from the Africans, if it be right to say that they are sprung from the Africans at all. It is perhaps nearer the truth to say that the Tasmanians in common with other Papuans are of the same stock as the Negroes, the common ancestry being neither Papuan nor African, or as much the one as the other, and that the Australians are derived from the same original stock through the Papuans with a strong foreign admixture.

Latham having suggested New Caledonia as the probable temporary home of the Tasmanians on their way to their last resting-place, it will be well to enquire here what grounds there may be for falling in with the suggestion. In physical appearance and especially in complexion and quality of hair the aborigines of New Caledonia like other dark Papuans bear a strong likeness to the Tasmanians. There is no better basis for Mr. Latham's suggestion beyond this likeness and the surmise that as it seemed improbable that Tasmania had been peopled from Australia, its inhabitants might possibly have drifted from the nearest settlement of Papuans most resembling themselves in appearance. Of the New Caledonian language I have only been able to see specimens given by Gabelentz in his Die Melanesischen Sprachen.* The phonic combinations resemble more the Australian than the Tasmanian. The only words which I can find that might be related to either Australian or Tasmanian words indifferently are 'mainya,' 'mandig,' 'muanden,' 'muala' *nose*, 'dendan' *to come away* and 'adheya' *foot*. Certainly few and doubtful analogues. Some of the New Caledonian dialects have an article, some have a plural. Tasmanian has neither, and the same holds good of Australian commonly though not invariably. A peculiarity of New Caledonian is the use of different forms of numerals according as an object is animated or not. The pronouns in having a dual resemble those of Australia and so far as can be known differ from those of Tasmania. Viellard mentions that '-ri' and '-ra' are suffixed to substances to indicate *whose* and *which* respectively, a feature unknown in the Australian and Tasmanian. There is no necessity for further comparison. The conclusion from the only available evidence is not in favour of affinity between New Caledonian and the other two languages. Its phonetic system is

* I have since examined the lengthy New Caledonian Vocab. given in Vocabulary of Australian Dialects, printed for the Melbourne International Exhibition of 1866, with the result of finding two or three more words that might be related to Tasmanian equivalents, but no evidence of even so close a relation between New Caledonian and Tasmanian as between the latter and Australian.

smoother than that of Victoria and Tasmania, but not so fluent and musical as that of central and northern Australia, and the data instead of suggesting that Tasmanian is more nearly akin to New Caledonian than to the language of the mainland, favour the very opposite conclusion.

The writer ventures to affirm that future research will only tend to corroborate the opinion which he has here enunciated and endeavoured to establish, namely, that Tasmania was first peopled from the Victorian shores. The point from which the emigrants left the mainland was probably Wilson's Promontory, from which a string of islands runs like stepping stones across the strait which were perhaps at one time larger and more numerous than they are now if they did not form an isthmus. It does not follow, however, that the most distinct vestiges of the old Papuan Australians should be found at this point. From philological considerations it would rather appear that the Lower Murray and perhaps the Lower Murrumbidgee served for long as a natural defence to the Victorian Papuans and that the invaders poured into Victoria across the Upper Murray, took possession of Central Victoria, pressing those who were being dispossessed back on either flank. At all events the most numerous and on the whole the clearest verbal analogies with Tasmanian are to be found in north-western Victoria from Lake Boga northwards, and about Bumbang, Tatiarra, and Piangil on the Murray. This markedly Papuan class of dialect extends on a line up the Murrumbidgee and embraces a large tract of country between this river and the Lachlan above their junction.

Having now demonstrated, beyond all question it is hoped, that the Tasmanians were the lineal descendants of the primitive Australian race, that the substratum of the modern Australians is Papuan of the same blood as the Tasmanians, and, as might naturally be expected, that the quarter of Australia which lies nearest to Tasmania retains most distinctly traces of the indigenes, the next duty is to attempt to disentangle and identify the other elements which go to constitute the Australian race as it now is.

The Dravidian Element.

Upon the original Papuan stock of Australia there must have been grafted a very strong scion from another and in some respects very different stem, and the union must have been effected in the remote dim past, the stock from which the graft came having since then altered by progressive development almost beyond identification. The people who formed this fresh addition to the primitive race were probably more slender in frame, lighter in complexion, and had smaller features and straight hair. What impelled them thither we know not. We are familiar with the idea of successive

waves of population starting from a common centre and being arrested only by an uncrossable ocean. History and Philology together have related to us how Roman and Teuton followed Kelt until the broad Atlantic stayed their occidental march. A Semitic population pursued the sons of Ham bearing the ancestral curse of servitude into the uttermost recesses of the dark continent. It is left on record, both in parchment and in temple ruins, how the Buddhists were driven out of India in the seventh century of our era and had they not found congenial soil in Java they might have continued their southward course and left their mark on Australia. But the fact that they came so near to the southern continent is an indication perhaps of the track of the line of least resistance to a fugitive people, at all events their migration hints at the channel along which might have flowed former streams of humanity expelled from India or its neighbourhood by irresistible pressure from the north. If Buddhism were found in Australia, the route by which it came would be easily determined, but resting where it did, its course indicates the line which would unite two termini of like features. The existence of such termini is demonstrable. Although the Australians are still in a state of savagery and the Dravidians of India have been for many ages a people civilized in a great measure and possessed of a literature, the two peoples are affiliated by deeply marked characteristics in their social system and by sure affinities in language.

A most striking peculiarity of the Australian system of kinship had been recognized and published long before the late gentle Rev. W. Ridley stated it and carefully traced it out, but to him is due the honour of accurately formulating its details (as it exists among the Kamilroi), and the Rev. L. Fison is to be credited with having clearly established its identity in essentials with the Tamulic system. As Australian marriage and consanguinity will be treated subsequently, it is needless to do more here than state that in certain important particulars Mr. Fison with the aid of Mr. Ridley has demonstrated the identity of the Dravidian and Australian systems of kin. The sum of these particulars is contained in the following proposition which is equally true for both peoples, and holds in it the root principle of the system of kin: —"A being a male his brother's children are considered his own children, his sister's children are his nephews and nieces, his sister's grand-children as well as his brothers are considered his grand-children."* Let A be a female, then with the interchange of the terms 'brother's' and 'sister's' the proposition is also true. The relational nomenclature is such as would arise if a group of brothers were joined in a communal marriage with a group of sisters. And further, "in Tamil the elder brother is distinguished from all the

* Rev. W. Ridley, Kamilroi and other Australian Languages.

rest by the title brother,"* and the Australian practice indicates some similarity of thought to this.

If so strong a bond unite the aborigines of Central and Southern India with the majority of the Australian tribes, among the latter exceptional departures from the prevailing type of relationship-nomenclature cannot invalidate the conclusion as to its source. Besides the powerful token of affinity to aborigines of Hindostan supplied by the possession of the same social ground-work, Australia bears also linguistic marks of Indian origin so deeply and widely impressed as to be indelible, and to serve as one of the most powerful and conspicuous bonds of union among the Australian dialects.

First of these linguistic marks may be mentioned the syllabation preferred by the genius of the Australian tongue. Like the Dravidian it is extremely simple and averse to compound or concurrent consonants. In Tamil† "double or treble consonants at the beginning of syllables like 'str' in 'strength' are altogether inadmissible. At the beginning, not only of the first syllable of every word but also of every succeeding syllable, only one consonant is allowed. At the conclusion of a word double and treble consonants like 'gth' in 'strength' are as inadmissible as at the beginning, and every word must terminate either in a vowel or in a single semi-vowel as 'l' or 'r,' or in a single nasal as 'n' or 'm'." These observations are just as true of all the dialects in Australia save those of the south-eastern and south-western corners, where the softer syllabation has been unable to displace the older harsher Papuan.

The next point of contact to be noted is the agreement of the stems of the Australian first and second personal pronouns singular with the Dravidian. Mr. Norris is said to have been the first to point this out, but on comparison the conclusion is inevitable to the most casual observer, the fact being self-demonstrative. Logan says that the roots of the Dravidian pronouns are 'na' 'en' 'ne' 'an' *I*, and 'ni' *thou*. Speaking generally these are the persistent stems of the same pronouns throughout Australia, the prevailing forms being 'ngai' or 'ngan' first person, 'in' 'yin' or 'ngin' second person. In Victoria again there are the greatest and most numerous divergences from the typical forms evidencing the more recent clash with another speech.

Caldwell notes that the Telugu forms its pronominal plurals by prefixing 'lu' to the singular, and compares this with the Australian additions 'lu' 'li' 'dlu' 'dli' etc., employed for a similar purpose. He also adduces a more Australian-like instance viz.,

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* Rev. W. Ridley, Kamilroi and other Australian Languages.
† Caldwell, Dravidian Grammar, p. 138.

the Dhimal on the north-east frontier of India, which has 'nâ' *thou*, 'nyel' *you*. The same writer further suggests a likeness between Tamil accusative 'ennei' *me* and the Australian 'emmo' *me*, but a much better comparison may be made between 'ennei' and 'nganna' the common Australian form for *me*. Other verbal roots common to both classes of languages might be cited, but nothing special could be adduced from them inasmuch as they are not peculiar to these two classes. It is different with the pronominal stems just considered, for in both cases they are distinguishing features and it is a very natural inference that the language which teaches a nation to say 'I' and 'thou' must be one of its very early and most influential pedagogues. Mr. Caldwell further shows agreement between Dravidian and Australian in the following particulars ;* the use of post-positions (a feature however on which stress should not be laid as it was very pronounced in Tasmanian), the use of two forms of the first person plural, one inclusive of the party addressed the other exclusive (a feature also of South Sea Island languages), the formation of inceptive causative and reflexive verbs by the addition of certain syllables to the root, and generally the agglutinative structure of words and the position of words in the sentence.

There are many more and very marked resemblances of which Mr. Caldwell was unaware. In Telugu 'yokka' or 'yoka' is sometimes appended to the inflection or natural genitive as an auxiliary suffix of case *e.g.*, from the ordinary possessive 'na' *my* is formed optionally, the equivalent form 'na-yokka' *my of me*, with which may be compared 'nganyunggai' *my* in the Kabi Queensland dialect, and various forms in '-yuck' occurring in Victoria and elsewhere.

The Dravidian languages† are destitute of any common term for brother, sister, aunt, etc., and use instead a set of terms which combine the idea of relationship with that of age, *e.g.*, elder brother, younger brother, and so forth. This applies generally to Australian speech. "In the Dravidian languages the second person singular imperative is generally identical with the root or theme of the verb, this is so frequently the case that it may be regarded as a characteristic rule of the language."‡ The same may be said of some at least of the Australian dialects. Compare Dravidian 'varu' *to come* imperative 'va' with Kabi (Queensland) 'baman' *to come* imperative 'ba.' Several years ago I wrote of the verb in this dialect "the simplest part is the imperative which commonly consists of one syllable and very rarely exceeds two." "It is a remarkable feature of the Dravidian languages that they have no relative pronoun whatever."§ This is also a feature of Australian

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* Caldwell, Dravidian Grammar, p. 53; † p. 477; ‡ p. 420; § p. 412.

speech "The mode in which a language forms its preterite constitutes one of the most distinctive features in its grammatical character, and one which materially contributes to the determination of its relationship."* Tamil forms its preterite by adding 'd' which for euphony is sometimes preceded by 'n,' owing to the Tamil fondness for nasalization says Caldwell. This may or may not be the reason for the appearance of the 'n,' but the common form of the preterite in Kabi, Wiradhuri and other Australian dialects terminates in 'n.' In the Dravidian the accent is on the first syllable. This is commonly the case in Australian and is easily accounted for by the agglutinating character of both languages.

It is a most formidable obstacle to the theory of the relationship of Dravidian and Australian speech that so distinguished a philologist as Dr. F. Müller, who was on the scientific staff of the "Novara," should have declared emphatically against it. He says that viewed even apart from the racial difference the glossarial affinities are too weak to support the affirmation that the languages are genealogically related. There are he adds, certain points observable which lead to the conclusion that such connection is impossible (unmöglich). Now for his arguments. He asserts that if a genealogical relationship existed, it would receive fullest expression in the speech of the West of Australia which is geographically nearest the Dravidian languages. But this is an unwarranted assertion, based upon the assumption that affinity of speech depends upon proximity of residence in a bee-line. Whereas it is assumed and pretty well proven in this essay, that migration was from the north not from the west, and that the west was one of the corners into which the purer Papuan race was forced. Further, he affirms that the 'nan-nin' type of pronoun prevails more or less in Thibet China and elsewhere as well as in Central India. A good argument, but the likeness is not generally so close. He further objects to the rules of class-marriage being introduced as evidence of relationship, because similar regulations are found in other parts. I think however, that the likeness between those of India and Australia is most marked. Besides the reasons already adduced for affirming a genealogical connection between the people of Central India (called Dravidians here be it observed only for convenience, aborigines of India would be more appropriate), I have fallen upon a cluster of glossarial analogies which joined with the other evidence should outweigh Dr. Müller's awful "unmöglich." Hitherto philology has been baffled in the attempt to establish relationship between the Australian numerals and those of languages to the north. A common Australian term for *two*

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* Caldwell, Dravidian Grammar, p. 390.

'bulla' is I believe a heritage from the indigenous Papuans. But there is another term for *two* running in a north and south line of varying width, from near the Gulf of Carpentaria to the Murray viz. 'barkoola.' I have found what I believe to be the analogue of this word in Central India in the Kuri language, and as corroboration of this view there are on both sides a cluster of corresponding words as follows :—

English.	Kuri.	Australian.
One	... nekor...	ngitya, nidda, &c.
Two	... barku...	barkloo, barkoola, &c.
Thou	... am	... imba, ngomon &c., unlike the usual Australian 'ngin.'
We	... ale	... a common Australian form.
Head	... dui	... turtoo
Man	... koro	... kurna, kore, &c., a common Australian form along the line indicated, though displaced immediately about the Darling by a local word 'Wimbeen.'

The Indian words are from Hunter's Comparative Dictionary of Non-Aryan Languages.

The last resemblance that I shall mention is the occurrence in both Dravidian* and Australian languages of a negative imperative or prohibitive particle. For instance in the Kabi dialect, most referred to because most familiar to the writer, with the imperative when prohibitive the word or particle 'bar' is used preceding the verb, on all other occasions other negatives are employed. This is a feature of South Sea Island languages also. If there were only one or two resemblances like those enumerated, between the two classes of languages they might be passed over as purely coincidental and not due to a common derivation, but the resemblances are too numerous and striking to be so lightly dealt with and can only be referred to a strong family likeness. As more Australian data becomes accessible there is no doubt that an exhaustive comparison will well repay for the labour, and it may be found that Dravidian and Australian languages may be mutually explanatory.

The famous Australian boomerang may be another means of establishing connexion with India where the weapon is also found, the kind which returns to the thrower being however so far as is known, confined to Australia. We search the Malay and Papuan armories in vain for any trace of it and are therefore obliged to credit some other race with its introduction to Australia, unless we unnecessarily assume that it was invented here independently. The boomerang is used in Africa about the upper course of the Nile, but we need not travel so far for it across barriers that might be termed impassable when it is obtainable so much nearer and in a place from which as we have seen a highway has led

* Caldwell, Dravidian Grammar, p. 36.

thither almost to Australia's shores. If the frame-work of society and those terms which are almost as close to a man as his own name, have both been introduced from India or its neighbourhood, it requires no stretch of imagination to suppose that the boomerang came along with them.

The Australian religious superstitions point rather to a connection with the South Sea Islands than with India, or as much to the one as to the other. In each of the three regions there is veneration for smooth pebbles. This is evidently a very ancient religious sentiment. Isaiah charged the Jews with this form of idolatry.* "Among the smooth stones of the stream," was their portion "even to them" had they "poured a drink offering" and "offered a meat-offering." In India the worshippers of Vishnu venerate a kind of pebble called *Salagrama*, specimens that have been seen by Europeans are said to be from the size of a musket ball to the size of a pigeon's egg. The particular sorts have an aperture with four spiral grooves in the perforation. The Hindoos believe that these apertures are the traces of Vishnu having entered the stones in the form of a reptile. It is worthy of note that among the New Hebrideans as the Rev. J. G. Paton has told me, the sacred pebbles have a small aperture regarded as the place of exit and entrance for the spirit which the stone represents. The *Salagrama* stones are found in the bed of the Gundak River and are supposed by Coleman to be mineralized fossils of the Belemnites or Orthoceratites. The *Binlang* stones found in the Nerbudda River are worshipped as emblems of Siva. The veneration then of smooth stones would seem to relate the Australians equally to the Hindoos and the Kanakas.

There may be another connecting link between the Dravidians and the Australians in the emblematic use of a red right hand daubed on rocks in various parts of Australia, generally about caves. Dr. Carroll in an article contributed to the Centennial Magazine (Oct. 1888) affirms a connection. He says the red hand "is still symbolic of the various attributes of Siwa, the Punisher Avenger or Destroyer of the Hindu." My examination into Indian mythology has failed to make this quite so clear, which I admit is only a negative argument and therefore not entitled to the weight of a positive argument, unless the field of negation be exhausted. But I find that in figures of the goddess Maha Kali a form of Parvati the consort of Siva, a number of red-palmed hands are delineated. There are seven red hands pointing downwards forming a cincture about the waist. The functions of Maha Kali are variously explained. Human sacrifices are offered to her. She is said to represent the active energy of all-renewing

* Is., lvii., 6.

time but sometimes she personates time as destructive. It is therefore possible that the red hand blazoned on Australian rocks may relate the Australian to the Dravidian, but as considerations to be brought forward later will suggest, the great probability is that this symbol was introduced not by an Indian race direct, but by a Malay people who have certainly carried hither sure tokens of Hindoo mythological influence as will be demonstrated when art and religion are dealt with.

The Malay Element.

Universal and strong though it be, the so-called Dravidian influence is insufficient to account for the great divergence of the Australians from the pure Papuans in physical features and in language. Another cause must be posited and is to be found in the Malay element. Since British colonization the Malays are known to have frequented the north and north-west coasts. Mr. Curr is of opinion that their visits are only of recent date, and quotes in support the statement of a Malay named Pobassoo whom Flinders met at the Gulf of Carpentaria in 1803. He professed to have been one of the first of his countrymen to visit Australia.* The historical knowledge of the Malay would not penetrate many centuries backward and moreover his evidence is overborne by the physique of the people in the north especially, but elsewhere as well, by the naturalization of a number of important Malay words such as the term for *teeth*, a change which mere visitors could not effect, and further, by faces of the Malay type and pure Malay words appearing in localities far removed from casual intercourse, as for instance in the extreme east and west.

As in the case of most other races, there would have been, indeed has been with the Malays a time of special activity and expansion. Coming then to Australia they would be unable to enter into commercial relations with its poverty-stricken, nomadic, naked people, and those who did not return to their own land would simply settle down to a life of indolence and sensuality and melt like snow-flakes in a sea of human life. But a ship-load of Malays attaching itself to an Australian community would not be absorbed without leaving some traces of its presence.

If the Malays arriving in Australia, even in twos and threes did not set themselves deliberately to teach and elevate the people but sank to the same savage level they could not possibly disappear with their unconscious influence absolutely obliterated. This influence is especially noticeable in the physique of the people in the north. They are more slender than the rest of Australians, have less hair on the body, and their skin is fairer. Sir. George Grey in

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* The Australian Race, Vol. I., p. 271, *note*.

one of his journeys saw three men of a fair race resembling Malays, and some of his party saw a fourth.* This was near the cave where he discovered some paintings of clothed people. These four men might no doubt be the posterity of one or two castaways. But even in the south of Queensland I have seen several faces distinctly of the Malay type with the nose snubby and rather small and the skin of a dark copper colour. Occasional instances of sullenness and taciturnity among the Australians are probably the result of Malay ancestry.

The admixture of Malay blood goes far to account for the difficulty, that a race such as the Australian with a Papuan basis should have the hair straight or wavy and not woolly. One even cross of a woolly-haired with a straight-haired race would hardly have transmitted such straightness of hair to posterity, but if after a first cross the fresh invasions, though only in scant filtrations were of straight-haired people, the effect of the mingling of two straight-haired races with one the hair of which was woolly would surely be to make the spirals uncurl.

Mr. Threlkeld whose acquaintance with a New South Wales dialect seems to have been very thorough, denies† that the Australian language has any close affinity with the Malay either in words or construction. This is a somewhat vague statement, in reply to which it can be said that although the traces of Malay influence on Australian language are not numerous they are unmistakeable and are observable at widely distant places. Duplication is met with in the Tasmanian, and may have been inherited in Australia from the primitive Papuan, it is not improbable however, that its excessive use on the continent is due to the Malay which reduplicates to form the plural. Often existing side by side with the form 'ngai' a very prevalent alternative term for the first personal pronoun is 'adhu' or 'atoo' which may perhaps be the equivalent of the Malay 'aku.' But I prefer to regard 'adhu' as an inflection of 'ngai' designating the subject when an agent. In the extreme north-west where Malay words might be most naturally expected, very few are distinguishable. Mr. Curr has noted 'unbirregee' at Port Darwin and 'engeegee' in the Cobourg Peninsula as the analogues of Malay 'gigi' meaning *teeth*. It is rather at unexpected places that Malay words turn up, indicating either that the Malay inroad if made at the north, took place in long past ages or that now and again parties of Malays, either from choice or necessity, landed and became naturalized at various spots on the east, north, and west, and modified the speech of the people first immediately round them

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* Grey, North-west and Western Australia, Vol. I., p. 254.

† Key to the Structure of the Aboriginal Languages, p. 82.

and then landwards. There are throughout Australian, in the main, two types of terms for *father* a 'bapa' type and a 'mama' type. As there are similar words for *mother* it might at first be conjectured that the terms for *father* and *mother* had become loosely transposed. I once thought so, but from the localities in which a particular type of term for *father* occurs, and from the occurrence of certain words in conjunction with the different typical 'father' terms I have come to regard the 'bapa' type of terms as evidences of Malay descent, and the 'mama' type as equally evidential of great predominance of Papuan blood. Thus for example, speaking generally, the dialects of Victoria and Western Australia which are the most pronouncedly Papuan are characterized by the 'mama' form; along the coast of New South Wales and the eastern coast of Queensland and for some considerable distance inland, localities which as I shall show possess unquestionable Malay words, the 'bapa' type of terms prevails whereas in Central Australia there is great variety of terms interspersed with 'bapa' forms but without a certain recognizable third type, unless it be the 'nunchun,' which is very probably primitive Papuan. The Dravidian word would approximate closely to the Malay and it would therefore be impossible to say with exactitude that a particular 'bapa' term was Malay and not Dravidian, but the closeness of likeness to the original Malay and the concurrence of other words certainly Malay will raise a presumption in favour of Malay lineage.

According to Marsden the Malay 'mana' is properly the adverb *where*, but is used idiomatically to signify *who*, *whom*, *which*, *what*. In many Australian words used interrogatively 'min' is a radical syllable. It might indeed be said that 'mina' or 'minya' is an interrogative stem. In the Kabi (Queensland) dialect for instance we find 'minyanggai' *what*, 'minyama' *how many*, 'minyanggo' *how*, 'minani' *why*. In the Kamilroi according to the Rev. W. Ridley, 'minya' signifies *what* and 'minyunggai' *how many*. At Barraba 'menari' is Kamilroi for *where*, at Port Macquarie 'minar' stood for both *what* and *where*. The Murra-worry tribe between the Warrego and Culgoa Rivers employed the word 'minyan' to mean *what* and 'minyangor' to mean *why*. Even to the north-east of Lake Torrens in South Australia this class of interrogative is found. This Australian root may be cognate with the Semitic 'mi' 'mah,' *Heb.* 'man' *Syr.* 'ma' *Ar.* In no parts is the Malay-type of term for *father* so general and so stereotyped as in conjunction with the etymon 'min' in interrogatives. But strangest of all is the occurrence of the word 'tungan' (spelt also 'tongan' and 'tungun') *hand*, which is evidently the Malay 'tangan' *hand*, also in the extreme east and there alone in Australia. This most interesting fossil is found on the basins of the

Nerang Creek and the Tweed and Richmond Rivers at the extreme easterly point of the continent, and reminds one of some great boulder. carried by an iceberg from a high latitude thousands of miles from its parent rock and deposited when the iceberg has been overset or dissolved.

There is yet another not much less astonishing relic of Malay speech near the same quarter and no where else so distinctly, viz., the word for *head* which in Malay is 'kapala.' In New England the analogue is 'kopul,' on the Hunter River it is 'gaberong,' at Sydney it was 'kabura,' on the Castlereagh it is 'ballang,' on the Bogan 'bula,' and surely a better example of a contiguous group of terms derived unconsciously from 'kapala' could not possibly be given. The Malay word is the model of which the others are imperfect copies, it is the bull's eye fired at, the others are the spots hit, some on one side of the centre some on the other. The word for *skin* is also probably Malay, in which language the equivalent is 'kulit,' while in the east and south of New South Wales the term used is some such form as 'yulin,' 'ulan,' 'yoolak.' It might be assumed that two or three Malays were handed as human curiosities from tribe to tribe and found a last asylum near Point Danger, but the concurrence of five such indisputable glossarial vestiges suggests rather that there was a strong infusion of Malay blood added to the Kamilroi and allied tribes.

Another centre of Malay influence is recognizable near Lake Torrens in South Australia whether it travelled from the north or south is not at present clear. The marks in this locality have undergone greater change and are fewer in number. I shall just cite three words which seem to me of Malay origin, though my opinion may not appear to the reader sufficiently supported. The words are 'yoora' or 'ura' *man*,* cf. Malay 'orang'; 'papi' or 'papee' *father*, cf. Malay 'bapa'; 'papala' or 'paparla' *head*, cf. Malay 'kapala.' Further north in the very heart of Australia at Alice Springs Telegraph Station occurs 'ildya' *hand*, which compares with Malay 'atya' and along with it is found 'arkoppita' *head;* the initial vowel is a trick of the dialect so that when the word is decapitated we get 'koppita' which appears to be Malay.

Another region where unquestionable Malay lingual traces exist is a tract on the east coast of Queensland from about 17° to 21° S. Lat. and inland to a distance of some two hundred miles. Three words diffused in this locality are distinctly of Malay origin, viz., those for *father*, *moon*, and *rain*. In Malay they are respectively 'bapa,' (Javanese 'baba'), 'bulan,' 'hujan,' (Javanese 'hudan'). The first is represented by forms such as 'baby,' 'babai,' 'abah,' 'yabba'; 'bulan' has analogues in 'bullanoo,' 'balano,' 'pallanno,'

* I have doubts about this derivation, 'yoora' may be just a local form of 'kurna.'

'palanoo,' 'bulbun,' and resembling the Malay word for *rain* ('hujan,') are the following 'yookun,' 'hugun,' 'ukan,' 'yugan,' 'yukan.' The Australian words are certainly echoes of the Malay. In the same locality with perhaps Halifax Bay as focus, I find two more words of Malay derivation occurring and nearly as distinctly recognizable. The Malay for *bone* is 'tulang,' and for *house* 'rumah.' Equivalents about Halifax Bay and neighbourhood are 'toola' *bone* and *wood* (Western River), 'toa,' 'tulkill,' 'tolkul' mean *bone*, and all over that part of the country the word for *wood* takes such forms as 'tula,' 'toolani,' 'tular.' It should be noted that the Australian dialects frequently apply one and the same designation to *bone* and *wood*. The Australian words corresponding to 'rumah' occur at Halifax Bay where 'ringo' and 'rongo' are used in the sense of *camp*. I would not adduce this as an analogy but for the preservation of the initial 'r' a comparatively rare initial in Australia and an anomaly in this particular spot.

On the Cloncurry River emptying into the Gulf of Carpentaria the word 'waramboo'—spelt also 'oorambоo'—is probably a corruption of Malay 'rambut' both meaning *hair*. At the same place, and only there, the term for *sun* is 'muntharra' which comes very close to the Malay 'mata-ari' and not very far distant at Burke Town the Malay 'bulan' *moon* has been the parent of 'ballamichi' the word now in use for *moon*. The general term in West Australia for ear is 'twink' or 'dwonk' which is most probably the Australian form of Malay 'duwan' also meaning *ear*.

Besides these outstanding examples of Malay influence on the language, occurring at places so far separated, others might be instanced the origin of which is less clear but probably Malay, and no doubt future research will disentangle many more words similarly derived. Enough have been given to show how extensive and powerful the Malay influence must sometime have been.

If Mr. A. W. Howitt's opinion proves to be correct that in Gippsland the social system still retains traces of the consanguine or Malayan family, this circumstance might also be urged as evidence of a strain of Malay blood among the Australian people. The admission of this as evidence is only hinted here, because even if it could be shown that the consanguine family has existed in Australia it would not necessarily have been introduced by the Malays. There is proof positive that the best cave paintings have been executed by people of Malay blood from the island of Sumatra, a strong presumption also that the rite of circumcision was derived from the same people and place, and I am disposed to think that the Australian message-stick is a childish imitation of Malay writing upon bamboo and rattan cane as practiced in Sumatra. These views will be stated at length and supported in

the proper place, and if they be well founded the extensive prevalence of the practices referred to attests how powerful the Malay influence has been.

Before proceeding to a new department of enquiry, it will be well to recapitulate the view of the origin of the Australian race taken by the writer. Australia is first contemplated as occupied by a purely Papuan people, probably both sparsely and unevenly distributed. It is not affirmed that they were of one family of Papuans only, the Negrito and the dark Melanesian may both have been represented and fused together, but for want of sufficient evidence this point is undetermined. Whence they set out and the route by which they came to Australia cannot be discovered, but taking it for granted that the cradle of the human race was in Asia whence all the nations have radiated like successive swarms from a parent hive, then, the indigenes of Australia would most naturally come from the north and by way of New Guinea. The lineal descendants of the original Australian natives were the now extinct Tasmanians who crossed from Victoria perhaps on dry land. Their migration from Victoria is held to be fairly established by the manifold forms of evidence already cited.

Australia is next regarded as invaded by a more advanced, fairer, straight-haired race which arrived at a very early period of the world's history, perhaps on the north-west coast and poured into Central Australia with a general south-easterly current. Partly driving before it, partly darkening itself by the tide of life upon which it presses, this stream inundates the whole country but not to an equal depth.

Finally another invasion takes place also from the north, first with some degree of continuity and then intermittently. This straggling stream winds about here and there, touches the shore at various places and is forced back inwards. Indeed this last influx may have come by several little rills, entering at places widely apart and gradually losing themselves in the life-lake as Austral rivers exhausted by percolation and evaporation disappear in the central plains. Australia is thus like a great lake which has been first filled by water of a particular tinge and into which a clearer stream flows, crossing the lake, remaining purest in the course of its main current then eddying hither and thither and leaving the original water least altered in the bays around the margin. After receiving additions of water of yet another hue from numerous little surface rills at different points, the places of ingress are closed the water stagnates and the problem is to distinguish the different constituents in the lake's contents assigning to each their place and relative proportion.

Upon the Papuan aborigines the Dravidian influx made a deep and general impression, the influence of the final arrivals, the

Malays, was slighter and more partial. The first tenure by the Papuans and their subsequent dispersion and dispossession qualified by partial absorption are shown by the relation of the Victorians to the Tasmanians, and also by the fact that a more particularly Papuan people fringes the coast especially on the south-east and west. For example, there is an element in the Victorian tongue which is much more akin to the language of the people of the extreme west of Australia than to intermediate dialects. The following words are illustrative of this agreement :—

English.	Victorian.	Western Australian.
Father ...	maam, mama	marm, mam, mama.
One ...	kaiap	kain.
Ear ...	wirn, wing, wiring	weening.
Sun ...	nowingi, ngwingi, ngawi ...	nanga, nganga, nonga.
Wife ...	layarook, leurook	yokka, yawk, york.
Walk ...	yanna, yan, yungan, this word is common in east, south and west of Australia but not in centre.	yenna, yangwa.
Opossum...	wolangi, wilang, wille, wollert	wallambine, wolumberree, (occurs towards the north)

Besides agreement in particular vocables there is a strong likeness in phonology. Then further, the word 'lar' signifying *tooth*, is found in Victoria and we have to cross the continent to the Gulf of Carpentaria before the same type with initial 'l' presents itself again, which it does at Caledon Bay in the word 'lerra.' Several words in 'l' may be taken as a class which serve to link together people in the extreme north who have been disparted by a wedge of linguistic influence forced in between. By this, as well as by Papuan physical characters being more pronounced on the coast, is the Papuan coast-fringe attested. The peopling of Australia in so far as the succession and distribution or commingling of different races is concerned has been not very unlike the settlement of Great Britain. The Celtic element in Britain is represented by the Papuan in Australia, the Saxon by the Dravidian, the Norman by the Malay. In both cases population has poured in mainly on one side, the earliest settlers gradually retiring to the farther shore. The second race takes entire possession of the centre shedding the indigenes to either side. Wales and Cornwall might correspond to Victoria, the Isle of Man to Tasmania, not in relative position to the mainland, but in isolation and racial purity, and the Highlands of Scotland would represent Western Australia. In each case from the first two races the bulk of the people is sprung and the vocabulary and grammar are inherited, while the third race sprinkled here and there over the land, has left the slightest lingual traces of its presence.

Physical Characters of the Australians.

The physical appearance of the natives is subject to considerable variation not only in different localities but even in the same community, and this as regards stature, muscular development, cast of feature and other particulars. Some of these differences are doubtless attributable to climatic influence, some to the difference of food products, while some are as certainly hereditary racial peculiarities. The wretched emaciated creature whose bones may all be told through his skin although often presented to us as the picture of the Australian is not a true picture. Such will be the appearance of parties where the food supply is always scant, or of others at a time of the year or in an unfavuorable season when food is much more scarce than usual. It is also true that the inhabitants of the interior and the north are more spare, and perhaps on the average taller than those in the east, south, and west, but men of muscular frame and stout build are common enough in the coast districts other than the north. Taking the continent all over, the average height of the men will not exceed 5 ft. 6 in., and of the women 5 ft. There is however, hardly a community in which two or three six-footers will not be found. As a rule the muscles are not largely developed, but there are numerous exceptions. In southern Queensland I have seen a type of man about 5 ft. 4 in. in height, thick set and powerfully muscular. One man of this stamp received his name from the massiveness of the calves of his legs. But even the lanker men are very strong and wiry in proportion to their weight, both bone and muscle being excessively tough.

The colour of the skin is shaded from a dusky copper to a brownish-black. The new-born babe is singularly fair but becomes gradually darker with age. The natives have a predilection for ebony skins as a mark of beauty, a preference which may be due to the fact that the substratum of the population was originally sooty-black. In those parts of the country which have already been particularized as more distinctly Papuan there is usually an abundance of hair on the face and breast, a characteristic which accompanies increased squareness of build and greater muscularity. In the central parts there is less beard and less hair on the breast, and in the north, in some parts at least, the body is smooth and the beard very scanty. Throughout the continent the hair of the head with some notable exceptions is of a glossy raven black very redundant and usually wavy. Where the Papuan blood is most predominant the hair is often curly and frizzy and sometimes woolly. I knew one blackboy in the south of Queensland whose hair was of a dirty yellowish-brown, and there are several well authenticated cases of true natives having hair that has been described, perhaps with poetic exaggeration, as golden yellow. A

particular instance is given in the family of a man named Teacup a leading blackfellow among his countrymen about Beemery Station between Bourke and Brewarrina in New South Wales. His children were copper-coloured and had long straw-coloured hair.* Such cases may arise from poverty in the black pigment, but seem too decided to be ascribable to such a cause.

There could hardly be a more striking contrast than that between the lank, tall, smooth, small-featured Northern Territory man and such a Victorian black as Bidhanin whom I fell in with lately. The latter was short of stature not exceeding 5 ft. 4 in. in height, his hair hung in heavy wavy locks or tangles, his face was almost hidden with beard and whisker and his bosom thickly covered all over with a dense crop of hair of two or three inches in length, so as to have quite a shaggy appearance. This man born at Ercildoune was a good specimen of what I take to be the Australian Papuan. His features were also of the typical Australian Papuan cast, the brow comparatively low and retreating, eyebrows prominent and shaggy, eyes fairly large the iris being dark brown and the white of a smoky-yellowish tinge, the nose large and broad but not to say flat, indeed sometimes decidedly Jewish, the nostrils wide, the mouth large, the lips thick but without the swollen thickness of the Negro lip, the cheek bones high, generally small and receding jaw somewhat prognathous, teeth large. This is the Australian Papuan face and may be met in many localities. I have a portrait of a black known as Old Peter who belonged to Milroy Station on the Culgoa River, New South Wales. This portrait might pass for a presentment of Bidhanin mentioned above. The trunk in front is completely covered with dense hair which spreads over the shoulders and down the outside of the upper arm. The beard is thick, long, and curly, with a tendency to fall in ringlets. Old Peter was evidently stout and muscular for his height.

Alongside of people like those described there may be found others with features which might be called good looking, judged even by European standards. These have quite a different style of forehead, narrow, smooth, rounded, high: also a much smaller nose sometimes straight and full, sometimes snub and inclining to be tip-tilted, the lips full but not extra thick and the facial outline a graceful oval. A poor unfortunate wretch of a black boy who went by the name of Dougal, a native of Yabber Station in the Wide Bay District, Queensland, would be one of the best examples of this latter type. His face as a whole might have been called handsome. He ended his days on the gallows-tree for crimes committed after he had become demoralized through the evil

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* Informant, Mr. Colin Fraser.

influences that blotch the gold-diggings. Although the eyes of the Australians are rarely if ever oblique, a face with a decided Mongolian cast about the brow, cheek bones and nose, is not uncommon.

There are certain peculiarities about the average Australian head which serve to mark it very distinctly. It is of a pyramidal shape, the skull is abnormally thick, the cerebral capacity is about the smallest of all races. Viewed in profile, the tip of the nose is the apex of an angle the sides of which recede with about equal obliquity from a horizontal passing through that point. The head is well poised, commonly having a backward lean, and is supported on a neck short and comparatively thick.

In general appearance the average Australian is symmetrically proportioned. More bone and muscle would undoubtedly be an improvement, for a too common attenuation of limb and fineness of ankles and wrists are suggestive of weakness. His hands are small and bony, the feet by no means large, seeing that they are always bare and used so much and in such varied ways. The aborigine is very strong for his weight, exceedingly agile, and has an erect, free, graceful carriage. As he is so largely dependent upon the exercise of his senses they are singularly acute. His powers of tracking are proverbial. My belief is that they are due as much to exercise as to peculiar natural capacity. While in his native bush all the blackman's senses are incessantly on the alert, it is therefore no wonder that his faculties of sense-perception should be highly developed.

Mental and Moral Characteristics.

For a people so low in the scale of civilization the Australians exhibit powers of mind anything but despicable. They are very keen observers, of quick understanding, intelligent, frequently cunning, but as might be expected neither close nor deep nor independent thinkers. In schools it has often been observed that aboriginal children would learn quite as easily and rapidly as children of European parents. In fact, the aboriginal school at Ramahyuck in Victoria stood for three consecutive years the highest of all the state schools of the Colony in Examination results, obtaining *one hundred per cent. of marks*. While among Europeans the range of mental development seems almost unbounded, with the blacks its limit is soon attained. An inherent aversion to application is generally an impassable barrier to the progress of an aborigine's education. In addition to which there is usually the absence of sufficient inducement to severe mental exertion. Unless in the case of those who are so situated that they cannot help attending school, most natives who have been taken in hand to be taught, have at best learned to read words of one

or two syllables and to write their own names in a very clumsy manner.

A common feature in the aboriginal mental make-up is a propensity for mimicry. They are fond of imitating one another with a view to exciting ridicule, and they instantly seize upon salient peculiarities of white men, especially of strangers, and reproduce them with considerable success. It is astonishing how easily and completely young blacks not cut off from intercourse with their relatives but living and working constantly among the whites, fall into European modes of thought. To the influences of the white men they move among, their mind seems to be a *tabula rasa*. Give such an aborigine a white man's features and complexion and he is to all intents and purposes a white man of the unreflecting uneducated class; some of them with little or no incentive save the approbation of Europeans, falling into the routine work of the station, doing it with fidelity and pride and for perhaps only a tithe of the white workman's reward.

In the aboriginal character there are many admirable meritorious elements, but there is a lack of a strong, inherited, combining, marshalling will or self-determination, and as a natural consequence the moral qualities are prone to operate capriciously. The natives are not insensible to promptings of honorable feeling but generally unless when repressed or constrained by fear they act from impulse rather than from principle, and their best inclinations are easily overpowered by pressure from within or from without. You could rely upon a black fellow being faithful to a trust only on condition that he were exempt from strong temptation. One of the most condemnatory testimonies that ever has been given of this people is that which was given by Mr. Jas. Davies (known as Darumboi by the aborigines) before a commission of the Legislative Assembly of Queensland in 1861. As far as personal experience went this witness was well qualified to speak, for he had lived continuously among the blacks for fifteen years and three months. He said very forcibly, "Hundreds of them would take your life for a blanket or a hundred-weight of flour. I wouldn't trust them as far as I could throw a bullock by the tail." "They are so greedy that nothing can come up to them." "They are the most deceitful people I ever came across." "The father will beat the son and the son the father. The brother will lie in ambush to be avenged on the brother; if he cannot manage him in fight he will lie in ambush with a spear or a club."

This I am sure was stating the case against the poor creatures too strongly. They are not wantonly untruthful, they are not deficient in courage, they are not excessively selfish, and they are by no means lacking in natural affection. But Mr. Davies corroborates what I have said of the presence of that defect of

character which may be termed instability. It may be said that the whole fabric of their moral character is in a position of unstable equilibrium. The slightest strain will destroy the poise. They have a courage which fits them to perform marvellous feats of tree-climbing, gives them spirit to assert their rights in the face of danger from the white man's superior knowledge and strength, and for a time at least, qualities them to excel as rough riders. But their bravery is neither steady nor deep-rooted. No doubt they are very covetous, but they are also very generous. One of the nuisances which used to vex squatters was the good-natured recklessness with which a black boy would scatter about among his friends the rations or clothes he had earned by his own labour and which he needed for himself.

As a rule the blacks are sympathetic and affectionate especially the women. Sufficient evidence of this is the way in which white men have been treated who have been unfortunate enough to be cast upon their mercy. Relatives are usually fondly attached to each other. The attachment between parents and their offspring is very strong and exhibits itself in kindness to the aged who are tenderly cared for, and indulgence to little children. One case of filial affection which came under my own notice I cannot forbear to mention. It was that of a boy who had travelled with a stock-owner to a considerable distance from his native place showing his love to his parents in a way very substantial for a black, by sending them a pound note through the post.

An almost universal feature in the aboriginal character is gaiety of heart. This I believe is a Papuan inheritance. Open light-heartedness was one of the pronounced features which Wallace observed distinguishing the Papuans from the Malays. Of the Papuans he says,* "They are energetic, demonstrative, joyous and laughter-loving, and in all these particulars they differ widely from the Malay." The open sunny-hearted qualities are indisputably Australian characteristics. The Australian is good-humoured, enjoys a joke, and does not long harbour resentment. The absence of constraint in the direction of joyousness is accompanied by liability to unrestrained bursts of passion which lead sometimes to most violent assaults. The black is a very vain man, conceited of himself and conceited of his countrymen for reasons no doubt sufficient to him if not to us. It is perhaps as much owing to his vanity or his fondness for praise as to any other motive that he has been got to work at all. For what other inducement is there to him to toil for the white man, and why should it not be to him rather a merit than a disgrace that from our point of view he is indolent? Has not nature dealt bountifully with him? If he

* The Malay Archipelago, p. 592.

make his demands upon her at intervals with sufficient urgency, he may loll on her soft warm bosom at his ease without discredit until hunger compels him to stir. At light kinds of labour he can work well and if it suits his purpose he can apply himself diligently for a while, but as he only has to provide for to-day he does not trouble about to-morrow. He is not invariably and in every respect improvident however. If he does not require to rob a bee's nest to satisfy present wants, he will indicate his discovery and assert his ownership by marking the tree which the nest is on, and will take the honey at some future time. In the Bunya Mountains in Queensland it was a common practice when the Bunyas were in season to fill netted bags with them, and bury a store in the gravel of a creek-bed, to be exhumed when required. The blacks of Western Australia store zamia nuts by burying in the ground, but without nets.* In these and various other ways the blacks show that they do not live an out-and-out hand-to-mouth life. They are not cultivators of the soil, they neither sow nor plant, (although I have known a black to plant a ti-tree in a locality where none was growing) but they reap grain and roots and fruits, preparing them in various ways for consumption.

Settlement by the British has usually proceeded without much resistance. The blacks have kindly assisted in their own dispossession and extermination, guiding the aliens through their forests, giving them much of their own strength at a beggarly rate of recompense, submitting contentedly to indignity and oppression, and rewarding injuries and insults with gentleness and service. They have committed robbery, rape, murder, and several massacres. True, but they have often been trained to such offences by the lawless, brutal, indecent, tyrannical behaviour of the white men with whom they have come into contact, for as a matter of fact the outskirts of civilization have a strong admixture of barbarism.

The first time that I saw a large number of blacks was at Durundur Station sixty miles from Brisbane, some four-and-twenty years ago. A bullock had just been slaughtered by the station hands, the blacks were congregated round the killing-place. A low white with a feeling of gay superiority swung the reeking bleeding lights and liver with a slap round the neck and on to the naked bosom and shoulders of an unoffending black woman. The gentle creature received this act of gallantry with a smile. I can never forget this disgusting insult and the meekness with which it was borne. It was at once an index and a type of much of the treatment which the natives have received from those who have taken their heritage away from them, and if the weaker side has

* Grey, Journal of Expeditions of Discovery, Vol. II., p. 64.

retaliated is it to be wondered at? The cruelties perpetrated by the native police upon their own kindred in the name of law, although excessive and often unwarrantable may be passed over here, because, granted the right to colonize and dispossess, a certain degree of conflict was inevitable, and it has been alleged by humane and competent judges, that where the native police, well-officered, patrolled a district, not only was property secure, but the blacks were exempted from vengeful and bloody attacks by the settlers. But woe for the lustful and atrocious conduct of individual white men, who feeling secure from legal penalties and native reprisals, outraged and oppressed and hunted at their will. The small success of missionary effort with which the unsettled life of the aborigines has had much to do, has led many people to conclude that they are not amenable to spiritual influence, and some settlers have adopted the fantastic, convenient, and self-exculpatory theory that the blacks have no souls. But on the mission stations especially, there have been numerous proofs that the gospel appeals as much to an aboriginal Australian heart as to that of any other nationality, and that notwithstanding instability of character Christ is the power of God to the Australian.

It used to be a common maxim among bushmen—"It's no use to hit a blackfellow with your fist he won't feel it," and the corollary was that a heavy boot, or a stout stick, or an iron bolt, or a stockwhip, were legitimate and suitable instruments for hortatory and punitive purposes. A powerful, heavy bullock driver would maul a black boy as an elephant might a baboon; to kick the offender, trample on him, and kneel or tumble on his chest and stomach, were usual courses of procedure, and the brute who could do these things deftly and inspire a wholsome awe in the outraged would be entitled to respect. "I would as soon shoot a black fellow as a dog," was no uncommon saying which some carried into practice. Concubinage was general, terrorizing and murder, (both by poison and bullet) plentiful enough on back stations, and used to be spoken about freely where not practised. At the bar of God the souls of the aborigines will have a heavy indictment to present against men of our blood who have wronged and brutalized them.

While acknowledging and deploring the excesses of which the colonists have been guilty, it would be unjust to overlook the manifold instances of habitual humane treatment at the hands of some of the station owners and their employēs. But nothing deserving the name of an equivalent has ever been rendered, whether by individual favour or associated effort in civilizing and Christianizing, to the weak peaceful kindly people from whom Australia's glorious golden land has been wrested so speedily and at so trifling a cost.

Dwellings, Clothing, Implements, Food.

The home of the blackfellow is identical with the tract of country over which he ranges, his dwelling is a structure of the airiest flimsiest kind. A breakwind of a few boughs proves sufficient in fine weather, and in cold or wet he procures two or three sheets of bark, sets them on end upon a crescent base-line, one sheet overlapping another, the lap increasing upwards so as to gather the sheets at the top. The whole leans upon a few light props placed in front, the lower ends of which are stuck in the ground, the upper ends converging and held together by a natural fork in the end of one of the poles.* The size of the house is determined by the number of occupants it will have to accommodate in sleeping posture. The floor is the green turf. The open front serves equally for door and window. As the fire is lit far enough out to allow plenty of room for the sleepers to stretch themselves with their feet towards it, a chimney is unnecessary. In rainy weather a small gutter is dug around the dwelling. Light huts of this description are peculiarly suitable to a nomadic people, unacquainted with metals, possessing few tools, and rarely exposed to severity of climate. They may erect them in the first instance with very little trouble, tenant them for two or three months at most, and then either carelessly leave them standing or lay the bark down flat and place a log or two on top of it to keep it from getting warped or lifted by the wind. If the bark is thus conserved, when the people revisit the locality the house is rebuilt in a couple of minutes. Such a structure constitutes a by no means uncomfortable sleeping apartment, and a residence commodious enough for people who can carry all their chattels with them; it has also this advantage, that it can be shifted as the wind veers and the open front be always on the lee side. When the natives were numerous their camps would contain twenty or thirty huts, and on the occasion of special gatherings there would of course be more. Each family would have its own dwelling. Young single men would sleep in groups apart from the families, and it is said that in some tribes the positions taken up by individuals were determined by considerations of kinship.

Almost the only real article of clothing worn by the Australians is the opossum rug. In the extreme north it is not in use. About the neighbourhood of Port Mackay in S. lat. 21° it is used,† but in Central Australia right across the continent the blacks are

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* This description applies to the most common dwelling; sometimes a booth of boughs suffices, while on the other hand rude little cabins thatched with grass and mud are met with occasionally; and near the most easterly point of Australia, probably owing to Malay influence, the walls of the houses were of stakes interlaced with vines.

† Mr. Curr's "The Australian Race," Vol. III., p. 45.

destitute of clothing. While travelling in the north-west Capt. George Grey* saw no opossum rugs in use north of 29° S. The opossum rug serves equally well for mantle and blanket and forms a receptacle on the mother's back in which she can carry her infant when on the march.

In making the rugs, the flesh is cleaned thoroughly off the skins, which are made pliable by rubbing with pieces of freestone. They are generally ornamented with rude scratches representing snakes, emu's feet, and the like, the figures being coloured with red ochre. The skins are neatly sewn together, kangaroo sinews serving as thread. I was told by a black boy that his people in the Wide Bay and Burnett Districts, Queensland, were wont formerly to make the soft papery bark of the ti-tree supply the place of blankets. It appears that the same practice obtains in the neighbourhood of Halifax Bay.† In many parts the females and more especially young girls, wear a fringe suspended from a belt round the waist, the fringe being made of various materials such as vegetable fibre, fur-cord, skin, etc. They are not excessively given to adornment of the person, but a few simple ornaments are very generally worn. Among these may be mentioned chaplets round the head, usually painted with pipeclay or ochre, strings of bright yellow reed beads, and a piece of shell-like mother-of-pearl suspended on a string worn round the neck.

Ornamentation of quite a different kind is effected by raised cicatrices arranged in rows in various parts of the body. These are commonly made on the back, breast, abdomen, shoulders and upper part of the arm, and only on males. The incisions are horizontal on the trunk and longitudinal on the arms. When first cut they are filled with ashes, charcoal, or some other innocuous material to keep the sides of the wound from closing, and to make them rise when healed, like a pair of lips.

In most tribes the males pierce the septum of the nose. All natives frequently anoint themselves with grease and charcoal. In fact this anointing is practised on new-born babes and is doubtless far more beneficial for infants than washing would be in their rude mode of life. On special occasions such as man-markings, corroborees, and fights, the men smear their bodies in hideous patterns with red and white clay.

The women make bags of net-work, the size of the mesh as also of the whole bag being regulated by the use for which the article is intended. The cord employed in the manufacture is usually made of fur. Baskets, known by the whites as dillie-bags are woven of strips of cabbage-tree, tough grass, or the bast bark of

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* He is quoted by Mr. Curr, but I cannot verify this reference.

† Curr, The Australian Race, Vol. III., p. 426.

trees like the currajong ; a piece of cord is attached to opposite sides of the edge by its two ends so as to allow the bag to be carried in the hand or slung upon the shoulder : these were the depositories of their valuables.

As regards weapons, I shall content myself with giving little more than a bare enumeration, for a full and accurate description Mr. Brough Smyth's "Aborigines of Victoria" may be consulted. The characteristic and distinctive Australian weapon is of course the boomerang, which is made of various sizes and weights and shapes. As already stated similar weapons are used in Africa and India, but that which distinguishes one kind of Australian boomerang from every other is the property of returning to the thrower.* In the south of Queensland the blacks had a very singular arm made of wood, about as flat as a boomerang, but considerably larger and heavier and bent at a right angle about the middle in the plane of its width. It was probably an arm for close fighting, a kind of battle-axe in fact, although in outline proportioned more like a single-headed pick. It resembles the leonile of Victoria figured in Mr. Brough Smyth's work, which was used in single combat. Wooden spears are universal. They are of diverse lengths and differ much in the design of the point, from simple sharpness to many barbs, sometimes cut out of the solid, sometimes of bone or flint affixed. Some tribes make reed spears as well. In many parts the spear is launched by the aid of a 'throwing-stick' about two feet in length. One end of the 'throwing-stick' is barbed, the tip of the barb rests on a hollow in the end of the spear and the other end of the 'throwing-stick is held in the hand. This auxiliary, like the cord of a sling, increases the velocity with which the weapon flies. The women in some communities have a special kind of spear about four feet long, which they employ either for digging or for feminine duels in which they are handled single-stick fashion, while loud threats and recriminations are interchanged.

There are clubs of innumerable designs, some comparatively light for the chase, and some very heavy for hand to hand encounter. These latter have sometimes rows of prominences carved upon them at the thick end to increase the severity of the blow. The club tapers to both ends which terminate in sharp points. Wooden swords, to be wielded with one or both hands are common, and shields both light and heavy, broad and narrow—the shield handle being generally formed by scooping out a horizontal groove on the back, and leaving a short longitudinal bar intact on the solid sur-

* Mr. Smyth quotes Mr. Ferguson on the antiquity of the boomerang. His evidence is I think conclusive as to the use of a returning weapon like the boomerang, among the Aryan races of Europe at the earliest historical times. The Aborigines of Victoria, Vol. II., p. 325.

face. The wooden weapons are usually more or less carved and are often partially coloured, either red or white.

The stone tools comprise hatchets, chisels, and knives. The tomahawk is shaped like a rude American axe, and is of all gradations of sizes, from what might be used by a child to a heavy stone head some twelve or fourteen inches long. The most common material is a bluish-green stone which takes a fine polish and has a clayey fracture. Axes made of stone so much alike that a superficial glance could detect no difference in appearance, may be found at places a thousand miles apart.* I have a broken axe-head which I found on the beach at Portarlington, no doubt the remains of an object that must have been greatly prized. The dark blue ground of the stone is starred over with milk-white specks. It is beautifully polished and that back further from the edge than usual. The axes were ground to a cutting edge of crescent outline. The axe handle tapered almost to a point at the end to be held in the hand. It was made either of a tough vine or part of half a sapling of suitable thickness which had been split in halves. The piece of vine or wood was doubled. In the loop thus formed the head was balanced and secured with cord and resin on the side next the haft.

The chisels had sometimes handles of bark wrapped round them. Besides the tools already mentioned there were stones for pounding food, whetstones, shells for dressing weapons, bone awls; twine made of wood-fibre, sinews, or fur; fish-hooks, nets, fishing-lines; water-vessels such as calabashes and even human skulls; the appliance already described as a climbing-rope; and various other local or less important implements.

Food.

Except in the case of particular persons or on particular occasions hardly a living thing was rejected as an article of diet, from the cicada to the kangaroo. The blackman's table was thus furnished with animal food of all kinds and flavours. Grubs found in green trees were highly esteemed; so were snakes, bandicoots, porcupines, emus, and men. When hungry, flesh would be eaten raw with avidity, but if time permitted it was roasted. A common practice was to bite off portions as they were cooked, the joint being handed round for each member of the group to take a bite, and then placed on the fire again. Honey, the product of the

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* Mr. O. R. Rule of the Technological Museum Melbourne, has favoured me with the precise names of the stone of four axes. One from the Burnett District, Queensland, and another from the Upper Darling, N.S.W., are Aphanite Greenstone; a third found at Cheltenham, Victoria, is Diorite; the fourth, mentioned above as found at Portarlington, Victoria, is Diabase Porphyry.

native bee, a very tiny, innocuous, slow insect, was very much in request where it was obtainable. In Queensland there was an ingenious and convenient way of eating honey which may possibly have been practised elsewhere as well. A sheet of the inner, tough, fibrous bark of a tree was procured. This was rubbed and softened until it became like a piece of thin matting or old bagging two or three feet square. It then formed a spongy rag and part of it would be dipped in the honey and afterwards sucked by one after another of the members of the family from the head of the house downwards. Even when the honey in substance had got exhausted the flavour would cling to the bark for a long time and would reward the sucker for his exertions and form a treat to offer a friend. It was certainly a very social form of enjoyment and an economical mode of taking food whether the reader would care to join in it is another question.

The supply of vegetable food was much more restricted. A kind of grass-seed called 'Nardu' was used by the natives in the north west of New South Wales. This is different from the 'Nardoo' of Central Australia, now familiarly known as the food which Burke, Wills and King tried to support themselves upon at Cooper's Creek. Fern roots and the Australian yam, a species of Dioscorea* are perhaps the most common edible vegetables. Other kinds whether the roots, stems, or fruits be eaten are local products; different districts producing food peculiar to them. The zamia nut is eaten within the tropics, certainly in the west and probably in the east also. In the south of Queensland a plant like the cassava or arrow root grows on the banks of streams, and its root is eaten when pounded and freed from the juice which is excessively pungent. The same locality is distinguished for the beautiful Bunya tree, the *Bidwillii Araucaria*, an ornament of the scrubs on the high lands. The cone of this tree is of gigantic size and in each scale there is an eatable ovule, which when mature is an inch or an inch and a-half long and about half an inch thick. The ovules are of conical shape like an almond kernel and covered with a tough envelope. When tender the fleshy part is all eaten. As the seed matures and the embryo assumes a definite shape the surrounding tissue is drier and less palatable and the embryo is rejected. When matured the natives prefer to eat the Bunyas roasted. The kernels are also pounded into a kind of meal called 'Nangu.' The Bunya is a wholesome and much relished food. Individuals claimed special favourite trees as their own, but generally everybody had the range of the whole forest. The boles are often from two to three feet thick, perfectly straight and without a branch for the first fifty or a hundred feet, above which

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* Grey, Journals of Expeditions of Discovery, Vol. II., p. 12.

the branches spread into a beautiful dome-shaped top. The climbing rope is called into requisition for the ascent which is a difficult process, as the bark is flaky and jagged and the leaves prickly-pointed. The matured cones as large as pumpkins fall to the ground with a tremendous thud, on which occasions provision is had by picking it off the ground. About the same neighbourhood and probably elsewhere if obtainable, the core of the top of a sort of Cabbage Palm forms a very juicy palatable food. The 'Nardu' grass-seed of New South Wales has been mentioned above, it is pounded and eaten without separating the husk.

Along the marshy grounds of the Murrumbidgee and Lachlan Rivers a plant grows profusely which is locally known as "Combungie' or 'Wangle.' The plants attain a height of seven or eight feet. They have a tap-root a foot or eighteen inches in length. These roots used to be pulled up and collected by the women of a small community. An excavation of circular outline was made in the ground, averaging three to four feet deep and fifteen to twenty feet across. Half a ton of roots might be gathered for a large oven and placed in the centre on a great pile of dry wood. On the surface were strewn layers of long grass and light sticks. Then the combustibles were kindled and the excavated earth returned as a covering. The time required for cooking depended upon the size of the oven, and might be several days. When the 'Wangles' were thoroughly done, water was continuously baled on to the oven until the whole mass was cooled. It was then opened and the food came out almost white as snow and not unlike parsnips or potatoes cooked.*

This wholesale culinary operation was conducted much after the style of meat-roasting by the ovens that are so numerous in Victoria, where I have seen the *débris* or middens over twenty feet in diameter, with a corresponding height, the slope of the sides being rather less than the angle of deposition, and the top flattened by obvious causes. In Victoria the ovens where used in the following way. A rude paving having been laid, a great quantity of stones and earth was heated by being heaped upon a huge fire of wood. Then the fire was withdrawn, and the game unskinned, was placed in the centre upon a layer of grass, more grass being strewed over it. The heated stones and earth were next piled on top and the oven was left thus until the meat was cooked, which would then be taken out and the skin would easily peel off.

The diseases to which the aborigines are specially subject are rheumatism and pulmonary complaints. These though aggravated by changed habits since contact with the whites, are probably no

* My informant is Mr. Humphry Davy, Balranald.

new troubles. Syphilis, introduced by Europeans, has terribly debilitated the constitution and corrupted the blood, but the scourge which sweeps off most of the natives is consumption. Indigestion and toothache are common, dropsy and heart disease also occur. All sickness from internal, unknown causes was attributed to sorcery practiced by an enemy. They possessed little or no knowledge of medicine, any remedies being almost exclusively externally applied. A common treatment was for the doctor or sacred man of the tribe to suck the part affected and pretend to extract from it a pebble of the sort used as charms. There seems to be efficacy in the sucking, for a friend of mine who was suffering severely from an inveterate, inflamed eye, allowed a black 'doctor' to mouth the eyeball, and the result of the treatment was immediate relief and speedy cure. Sometimes the doctor would apply a sacred stone to the part that was aching and profess to extract the cause of pain. From the analogy of a similar practice in the New Hebrides this may have been originally a kind of exorcism.

Wounds were often plastered with clay. In the case of sores on the limbs, circulation would be checked by the fastening of a ligature above the sore part. Mange was frequently caught from the dogs. There was a disgusting monkey-like method of dealing with it which I have seen practised. One person using a short pointed stick would prick the pustules all over the body of the patient who would be reclining in a convenient posture and enjoying the operation. For headache a band was fastened tightly round the temples. Besides common remedial measures, such as those mentioned, each community would have methods peculiar to itself.

There is considerable difficulty in determining the length of life of the blacks, the generation born after contact with white people being on the whole very short-lived. From numerous instances it would appear that former generations were fairly long-aged. Almost every small community would have in it two or three men or women over seventy years of age, and here and there some centenarians would be met with. The impaired constitutions of the present generation, their unhealthy habits arising from a combination of native with European modes of life, the ease with which many fall into vicious practices, preclude the possibility of many of them attaining to hoar hairs. It seems very probable that in Victoria and New South Wales at least, there will not be a single pure aborigine surviving fifty years hence.

Government, Laws, Institutions.

Various writers have shown that the noble savage is not the child of liberty which he is popularly supposed to be. On the

contrary, while roving the forest in apparent security and freedom his life is very uncertain, and from his childhood he is shackled with burdensome ordinances inherited from his ancestors, for the observance of which he usually has no intelligent reason to offer. The rules which prescribe the conduct of the Australian aborigine are in every place numerous and strictly obligatory, infraction being followed by penalties which always involve the risk of injury to the person and often the forfeiture of life. The unquestioning obedience which commonly marks submission to these vexatious regulations is very striking. The cohesion of a community depends entirely upon consanguinity and derives no strength at all from governmental authority. It is simply an aggregation of families among which the older men have a certain amount of control, derived naturally from age and experience. There is no recognized head, whether king or chief, neither is there any definite ruling body, elective or hereditary. Men of preponderating influence are those who are distinguished for courage, strength, and force of character. These in conjunction with the elders, generally advise as to the public actions of the community, settle internal disputes, and enforce obedience to traditional law. It is an abuse of language to designate the most influential man by the name of chief or king, as has occasionally been done, and an unwarrantable importation of foreign ideas into descriptions of Australian life. People, speaking virtually one and the same dialect, will be spread over from five thousand to ten thousand square miles of territory and sometimes more, and cut up into several small communities which though usually friendly may be involved in hostilities. Such a group of related septs would form what Mr. E. M. Curr has designated associated tribes, association however being not entirely dependent upon close approximation of language. As a general rule dissimilarity of speech connotes mutual internecine enmity, every stranger that falls into one's power being a proper object of slaughter. The so-called associated tribes barter with one another, intermarry, and unite against a common foe.

To one accustomed to think only of the relations in civilized society, perhaps the most singular and conspicuous feature in Australian social life is the system of kinship and the corresponding matrimonial restrictions. This point of study is particularly interesting and instructive as bringing us face to face at the present day with a condition of society and intersexual relations which from numerous instances existing in parts of the world widely separated, are generally believed to have universally prevailed in what are now the most advanced races, at a prehistoric period. Sir George Grey gets the credit of having been the first to place on record the Australian peculiarities of kinship and descent. While innumerable modifications are current there are a few broad

characteristics which mark the system and its accompaniments almost everywhere:—

First, A being a male his brother's children are considered his own children, his sister's children are his nephews and nieces, his sister's grand-children as well as his brother's are considered his grand-children; and if A be a female, with the interchange of the terms 'brother's' and 'sister's' the proposition is also true.

Secondly, every community is constituted by two or more classes, most commonly four, and every individual bears one or other of the class names.

Thirdly, descent is through the females and this is especially marked by the class-name of the mother determining the class-name of the child.

Fourthly, marriage within the class is forbidden on pain of death, there is consequently exogamy in respect of classes, and usually tribal septs or communities are exogamous as well.

Systems of relationship like the Australian have been named by Mr. Morgan classificatory. Beginning with an examination of a form called the Ganowanian, prevailing among the North American Indians, he made a comparison of other forms in various parts of the world, and came to the conclusion that the names of relationships which at a first glance appear loosely and inappropriately applied are names of blood-ties, and indicate communal marriage, or group allied to group at a more primitive time. He is vigorously opposed by Mr. McLennan, who regards the relationship of the classificatory system as simply "comprising a code of courtesies and ceremonial addresses in social intercourse."*

The discussion of the merits of these two hypotheses would require a special monograph. The writer inclines to the opinion that the terms used in the Australian system of kinships denote what were once blood-ties, but it does not follow that they are evidential of former group-marriage, unless the connubium of some own brothers with own sisters be understood by that name. What seems to have originated such a theory is the fact that exogamous groups or classes are comprehended within one community. The question of the former prevalence of group-marriage will be settled by an accurate account of the origin of these classes, phratriæ or gentes as they may be variously called. To explain their origin Mr. Morgan assumes that following upon primeval promiscous intercourse there was marriage between a set of brothers and a set of sisters, and that a recognition of the resulting evils led society to deliberately partition itself into intermarriageable classes with a view to their prevention.

The Rev. L. Fison in the work "Kamilroi and Kurnai" emphasizes and endeavours to corroborate Mr. Morgan's view.

* McLennan, Studies in Ancient History, p. 273.

Mr. Fison in dealing with the rise of the Australian exogamous classes lays great stress upon the Murdoo legend, an aboriginal tradition, the substance of which is that the classes restricting matrimony were constituted to remedy the bad results of incestuous marriage. That these classes do prevent certain close marriages is true, but is it logical to conclude therefore that they were inaugurated for this purpose? It seems to me that the Murdoo legend is too flimsy to support any conclusion and *if the classes were due to some other cause than a conscious reformatory effort, their effects would still be the same.* I prefer to regard them as springing from natural conditions of life, having a reformatory tendency no doubt, but the reformation neither recognised nor designed by those who were the subjects of it. The obstacles presented to intermarriage of persons near of kin has put enquirers upon what is probably a wrong scent. Independently I arrived at the view which Mr. McLennan takes, viz., that the matrimonial classes are memorials and results of the coalescence of different stocks of people, which were once distinct and exogamous tribes or races, and this view is in harmony with the theory of the origin of the Australian people enunciated in this treatise. Both Mr. Morgan and Mr. McLennan set society in motion under a condition of promiscuous intercourse. This is quite an imaginary starting-point and reduces mankind to a state of degradation lower than the brutes, which in many cases and especially in the case of the higher apes go in pairs. If gorillas have sufficient decency to pair off, why may not primitive man have done the same? With a view to accounting for the change of kinship through females to kinship through males, Mr. McLennan finds it expedient to make polyandry follow promiscuity, and the necessity for polyandry he finds in the infanticide of female children and the consequent disturbance of the balance of the sexes. But the prevalence of infanticide of female infants is only postulated not proved, and although in various countries polyandry has been the rule, and in others has been practised to some extent, nevertheless a polyandrous stage of society in all races is far from established. Judging from the propensities of humanity as witnessed at the present day in savage races, polygyny is a much more favoured form of connubium than polyandry. And far more may be said in support of there having been as a rule a surplus of females in a community than the contrary. Nature herself tries to maintain the balance of the sexes and compensate for the greater mortality among males by an excess of male births. On the occasion of nations meeting in battle the victorious side slaughters the males and usually preserves the females, and then either for the conquerors or the conquered polyandry would seem too unnatural to be dreamt of. Pharoah's destruction of the Israelitish male children although

an exceptional case is typical of the risk to male life at the hands of a master nation.

Polyandry and agnation are bound together in Mr. McLennan's theory by rights of succession to inheritance, in other words by property, and moreover the conditions of life with which he mainly deals to explain succession through males are those of semicivilized peoples among which both sexes have accumulated property. There is a stage further back than this exemplified in Australian aboriginal life, at which there is scarcely aught but territory to claim and it is tribal rather than personal property, and as for the women, with exogamy in regular operation, they possess nothing beyond a few threads, nets, baskets, or the like, about the succession to which there is likely to be no quarrel. At such a stage woman possesses practically nothing but her name and her charms, while she herself is man's most precious property. It seems to me that the primitive idea of acquiring and holding woman as one's own property is at the root of connubial systems, and in the majority of cases would conduce to polygyny rather than to polyandry. Let it be assumed that in the rudest state of society men covet women to be their peculiar possession and the following results, which obtain in Australia, ensue. The matured males by dint of force, and the elderly men by the authority of age, will contrive to provide themselves with a plurality of wives while the younger men must of necessity remain single unless they procure partners by capturing them from an adjoining tribe. Women would thus be in continual demand, and exogamy would be conducted first in a purely hostile and predatory manner and later by barter or agreement of some kind.

From being in a sense inevitable, exogamy would become the normal mode of marriage, and the result would be that the wives in a tribe would be of a different tribe from their husbands and would have the name of their own tribe clinging to them. With indefinite paternity and definite maternity the children would belong to the mother and be recognized as of her blood, whatever general or tribal name the foreign mothers bore would also be attached to their offspring, unless the latter received a new special name from their hybrid appearance. Thus in process of time a homogeneous tribe would become heterogeneous in blood and embrace two, if not more, intermarrying classes and tend to endogamy as regards the tribe, exogamy still characterizing the classes. The structure of Australian society carries us no further. Put briefly the stages of social development would be :

I. A homogeneous community having cases of

(1) monogamy

(2) the consanguine family (marriage within the family)

(3) the Punaluan family (a group of brothers having their wives in common, or a group of sisters having husbands in common)

II. Exogamy as between tribes become alien to each other by long separation. Exogamy occasioned by
(1) recognition of women as valuable personal property
(2) monopoly of wives by men of influence.

III. A heterogeneous community embracing two or more exogamous intermarrying classes, said classes representing former alien tribes, and having cases of
(1) monogamy
(2) polygyny
(3) polyandry.

the difference of system being regulated by expediency.

Exogamy would tend to succession through males, even while there was uterine inheritance of class names, because the sons would remain on their father's ground while the daughters would pass to other tribal territory, at first by capture and empty handed. But marriage *within* a heterogeneous community once reached, and personal rights in property admitted, there might be inheritance either through males or females.

If the exogamous classes in a tribe be the mark of fusion of two or more tribes brought about by intertribal alliances, there is no longer any occasion for positing the former existence of communal marriage, except in the very restricted form referred to above, viz., a group of brothers married to a number of wives in common or a group of sisters married to a number of husbands in common.

The number of classes in an Australian community may vary from *two* as among the blacks at Mount Gambier and in Gippsland to ten* as among the Kamilroi, but the most common number is four, and there is good reason for concluding that at first there were only two classes which have been multiplied by subdivision or else by communities amalgamating. Six of the Kamilroi classes are certainly subdivisions of the four larger ones, and these again were either subdivisions of the two primary ones or the result of the combination of two different tribes. Where there are four classes they sometimes fall into related pairs, marriage being prohibited between the sections in one pair as if they formed just one class, while either section of one pair could marry into either section of the other pair. This is the case with the Kabi tribe of Southern Queensland. The Kabi community has four classes—Barang, Balkun, Bonda, and Dherwen. Marriage is prohibited within any of the classes. Barang may not marry with Balkun,

* Among the Narrinyeri of S. Australia there were eighteen divisions called clans by Mr. Taplin, but which were virtually classes like the above as they served the same purpose.

nor Bonda with Dherwen, but either Barang or Balkun may marry either Bonda or Dherwen. There is this peculiarity to be noted about the descent which is perhaps also a proof that the four classes are subdivisions of a primary two, that the class-name alternates from mother to offspring by a continual recurrence of the same pair of names, thus one line of descent will be Barang, Balkun and the other Bonda, Dherwen *ad infinitum*.

Without postulating a fision of two classes into four, the existence of the four may be assumed to be due to the coalition of two communities which had each already two classes. Mr. Fison suggests* this solution of the multiplication of classes from two to four, and the writer thinks that no better can be offered. At Port Mackay, Queensland, the names of the two primary divisions still survive. The names there are:—

Primary Divisions.	Secondary Divisions.
Yungaru ...	... { Gurgela Burbia
Wutaru ...	... { Wungo Kuberu

Cohabitation between members of the same class is held to be grossly criminal, and is in many instances punishable by death. The union of individuals belonging to classes that cannot lawfully intermarry is equally abominated. Even in cases of rape the class rules are respected. The profound regard which the blacks show for restrictions fettered upon them by tradition and for which they can give no better reason than that such is the practice, points to a very powerful originating cause and a sanction derived from condign and bloodthirsty penalties. To me at least, it is incredible that the segmentations into exogamous classes could have been deliberately made by agreement to avoid the evils of incest for these would not be easily recognizable by nomadic savages. It seems more harmonious with social development to suppose that the gentes arose in the following manner. The women of a tribe were highly prized and jealously guarded by their husbands whatever the type of connubium may have been, and bachelors who by reason of youth or other disability, could not obtain wives of their own tribe, (*i.e.* what subsequently became their class), were obliged to obtain them by capture. The danger of tampering with the women of their own tribe made exogamy the rule in course of time. There may also be an auxiliary cause to exogamy among barbarians in what may be called an instinctive hankering after foreign women. Some light may be thrown upon the matrimonial classifications by Hamor's proposal to Jacob,†

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* Kamilroi and Kurnai, pp. 71 and 72.

† Genesis xxxiv., 9, *et seq*.

"And make ye marriages with us and give your daughters unto us and take our daughters unto you and ye shall dwell with us." Had this overture not miscarried, two families might have amalgamated and become "one people" as was proposed, embracing two intermarrying but exogamous classes. In this instance the cross-marriages would have begun by compact not by capture, and subsequent historians or ethnologists might have accounted for the rise of the classes by a supernatural wisdom like that which characterizes the Murdoo legend.

Messrs. Fison and Howitt obliterate the Australian individual in the distant past, regarding him as merged in his class. The class is an entity of which one person is only a fragment and all the members of a class have marital rights over all the members of the class or classes with which they may intermarry. This is the hypothesis founded upon an incomplete induction from several practices now extant. It is impossible here to traverse the whole question, but having carefully weighed the arguments in favour of group marriage while admitting that there is a good deal in them to point to it, I fail to see that communal marriage has been proven to exist in the past and it certainly does not occur in Australia now, on the contrary, the conclusion contains much more than there is in the premises. A good deal of weight is attached by Mr. Fison to the story of Mr. Bridgeman's native servant, who boasted that in going a journey of a thousand miles he could get a wife every night all along his route. To most Australian bushmen, who are well aware that when a blackfellow crosses the boundary line of his own territory he takes his life in his hand, unless he be on special business for his tribe or under the protection of a white man, the story of a thousand miles of wives will only account as a traveller's tale.

What Mr. Fison's facts go to show is the scrupulously fenced chastity of classes in respect of those classes with which they do not intermarry. As I have no desire to underate the evidence for group-marriage, I may mention a practice said to have prevailed among the Kabi, and so far as I know not hitherto observed elsewhere in Australia, which may be used to support the theory of group-marriage if it do not rather indicate the assertion of a right to share in a wife's favours by those who have helped to capture her. I refer to the occurrence of the *jus primæ noctis* which I heard of first from the lips of a white man who had on occasions lowered himself to the level of the aborigines and which was afterwards certified to me by a black boy. But Mr. Fison seems to have overlooked that a blackfellow holds his wife as his own special property against all comers, and allows intercourse with her only as a favour or for hire. This is the rule, and jealousy is a powerful passion with most aboriginal husbands.

The classes are most commonly designated by names of animals, especially eaglehawk and crow in the south-east; and emu, kangaroo, iguana, opossum, turtle, snake, native bear, are common names elsewhere. In some parts the names of plants are applied to some of the classes. An enquiry into several peculiar usages is suggested here, viz., the mode of naming communities, the nomenclature of the classes and the occurrence of totemism.

In New South Wales and Queensland especially, but not exclusively there, a community derives its own name and the name of its language from one of its verbal negatives. Unless a more reasonable ground for this style of designation can be adduced the writer would be disposed to account for its origin in the frequent repetition of 'no, no,' by persons when addressed in a dialect which was not fully intelligible to them. It very frequently happens among ourselves that a man is nicknamed from a word which he is fond of using, and we need only to extend this mode of naming to a community having one speech to be able to give a rational account of the origin of naming tribes from their negatives. This certainly involves the conclusion that others attach our name to us, which is however the usual practice with proper names of individuals. One tribe, the Pikumbul on the Dumaresque River, N.S. Wales, is named from its affirmative, the reason for the imposition of a name from a negative will suffice to explain the derivation of one from an affirmative, viz., excessive iteration of some word. Other tribes again are named after some animal such as the eaglehawk *e.g.*, the Meebin tribe near Point Danger.

There must have been a time when all the Australian tribal names could have been counted on the fingers of one hand. What was their significance in that primeval day? It is hardly probable that they were derived from negative adverbs. It is more likely that they were names of animals as appealing vividly to the imagination, the echoes of which we still hear in the eaglehawk and the crow of the south-east of the continent. There may have been cotemporaneous with the animal names, traditional racial names such as Koolin with its variants in Victoria, and Murri in New South Wales, if indeed these be not themselves animal names likewise. If the original tribal names were names of animals, and if the gentes are monuments of distinct ancient races the gentile names are at once accounted for. There must have been to the savage mind a valid reason for the adoption of such names: perhaps a fancied resemblance between particular families and certain animals, perhaps an attempt to explain human origin on a development theory, at all events the principle of nomenclature once adopted, its application could be indefinitely extended, as it evidently was. From the vestiges of this system of designation it

would appear to have been in vogue in prehistoric times among the whole human race.

The characterizing of gentes or clans or tribes by animal names is manifestly related to totemism though not identical with it.* The animal the name of which is borne by the class is not usually venerated by the members of that class, in fact the significance of the class-name is sometimes lost altogether. Where totemism prevails and it is pretty general in Australia (though its existence may not be known to the whites of the locality) each individual in the tribe bears the name of an animal or plant which is his totem. His totem is revered and protected by him. and although he may eat of the totems of others he will not injure or eat of his own, unless compelled by starvation to do so. Natives of the Narrinyeri tribe do not scruple to eat their totems. Among them also the bearers of the same totem constitute an exogamous clan. At Mount Gambier, Victoria, there are two exogamous classes Kumite and Kroki, each divided into five sub-classes† which bear totems, and under the sub-classes all natural objects are classified. In this case marriage is independent of the totem. I believe that totemism in a more or less pronounced form prevails throughout Australia, even where not recognized by Europeans. I remember seeing a black boy playing with a little lizard, I thought he was cruelly using it and remonstrated. He disclaimed hurtful intentions and declared that it was a friend of his, and another black boy confirmed his statement. I did not know at the time the importance of this admission, or I would have followed up the discovery by enquiry, but I am of opinion that this was a trace of totemism, the existence of which in the tribe referred to, none of the whites had any idea of.

It seems probable that the clan-name and the totem were once identical, but that in certain places they have become differentiated and the application of the principle of naming after animals has become extended. By the Narrinyeri a man's totem is called his 'ngaitye.' The Rev. G. Taplin refers‡ to a statement made by Dr. G. Turner about a form of Samoan fetichism closely resembling the Australian totemism. A man's god may appear in the form of some particular animal which thenceforth becomes his object of worship and is protected by him, and the name for such animals is 'aitu,' *i.e.* gods, a word bearing a striking resemblance to

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* The article on Totemism in the Encyclopedia Britannica includes naming of tribes after animals in the system of Totemism. Whether this should be done or no is simply dependent upon the wider or narrower definition of Totemism. The definition in the article requires "superstitious respect" for the animal after which the group is named.

† Curr, The Australian Race, Vol. III., p. 461.

‡ Native Tribes of South Australia, p. 64.

'ngaitye' which may however be no more than coincidental. Whatever may be the local peculiarities of totemism its world-wide occurrence proves that it has been inherited from the common ancestry of the now much differentiated peoples who retain it, and that therefore it is almost as old as Adam, and part of the baby-clothes of the human race.

Marriage, Man-making, Mutilations, Burial Customs.

Reverence for age and authority has greatly aided the elderly men in monopolizing the wives of the class with which they intermarry. Betrothals are exceedingly common, a female child being usually betrothed by her guardians to some elderly friend who attaches her to his household when she is perhaps not more than twelve years of age. Betrothal is, I think, founded on barter, the father or brother or father's brother having the right to give the maiden away. Brothers thus betrothe their sisters in exchange for women to be their own wives. Side by side with the betrothal system is that of elopement, which now-a-days is usually more fictitious than real. It is in cases of elopement that the guardians of the female demand satisfaction from the man with whom she has levanted. A tremendous tempest of wrath is feigned and no doubt the combat is not unattended with risk, but after it is over the cloud of anger and ill-will is completely dissipated. There are besides, instances of real elopement after which the woman if caught will be severely handled, and the paramour will receive a sound thrashing in real earnest if the injured person be powerful enough to administer it.

Marriage by capture takes place between members of hostile communities. Sometimes a surprise party will be organized to attack a camp, slaughter the males, and abduct and appropriate the females. This wholesale abduction is paralleled by individual cases of forcible abduction, on which occasions the women if resisting will be cruelly beaten.

In Gippsland marriage by agreement is the rule, pursuit and capture being feigned.* With varying details, marriage by mutual consent will be found in other parts of Australia as well, but not reaching consummation exempt from the results of marriage by elopement. The use of love-letters is perfectly understood by the Kabi natives of Queensland. The love-letter is a bit of a twig about an inch and a-half in length, and marked with three, small, transverse notches, the middle one representing the 'dhomka' or postman, the other two the lovers. I have seen one of these in course of transmission. A black boy fished it out from the lining of his hat where he had it sewed up. He carried it in this recep-

* Mr. A. W. Howitt, Kamilroi and Kurnai.

tacle for several months until he had an opportunity of delivering it to the damsel for whom it was intended. The aboriginal pair had met and fallen in love at a great festive gathering sometime previous, and the love-letter was a sort of expression of adhesion to engagement. These forms therefore of marriage occur, marriage by betrothal, by elopement, by forcible abduction, by capture, and by mutual consent, the practice varying with the community.

The mutual avoidance of mother-in-law and son-in-law may be conveniently referred to here. It is noticed throughout the continent and prevails in the South Sea Islands as well. One explanation which is offered for it is the abhorrence of incest, but this is not satisfactory, for if this were the reason there would be quite as strong grounds for shunning intercourse between mother and son, father and daughter, brother and sister. This last condition the separation of own brothers and sisters seems to be fulfilled in Fiji, but as it does not hold elsewhere it may be explicable on other grounds. The Rev. D. MacDonald supports with warmth the hypothesis that detestation of incest is at the root of mutnal avoidance between a man and his relatives-in-law, and he gives some interesting facts about this practice in Oceania.* For instance, a husband has to shun his father-in-law as well as his mother-in-law, and all the females of the same gens as his wife. All these persons avoided bear in reference to the husband the same term of relationship.† Perhaps an etymological examination of that term might be of service. But if danger of incest be the ground for avoiding the mother-in-law it cannot be in the case of a man, the reason also for separation from his father-in-law, and moreover here is a very pertinent question to put to the facts surrounding this peculiar restriction, why is it that the daughter-in-law is not tabooed in the same way as the son-in-law? There appears to be no danger of incest in her case. It seems to me that the cause of estrangement is that the son-in-law has been in times long past, guilty of an offence which his wife's relatives, and especially her mother grievously reprehend, and which custom forbids the latter to condone, and the offence, it is most natural to conclude, has been the forcible abduction of his wife. Mr. MacDonald cannot bear to think of such a brutal state of things being normally tolerated, even among barbarians, but our moral sensitiveness should not blind us to the testimony of facts, and we

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* Rev. D. MacDonald, Oceania, p. 181 *et seq.*

† Among the Kabi people of Southern Queensland 'nulang' means son-in-law, 'nulanggan' mother-in-law, '-gan' or 'gun' is the feminine termination, so that 'nulang' designates the relationship on both sides. In Victoria a word practically identical, viz., 'naluun' or 'gnulluun' signifies the same relationship. The etymology of the aboriginal term is very desirable as likely to throw light on this obscure subject.

know that marriage by capture was not uncommon in recent times even in the Highlands of Scotland, a notable instance in the last century being the second marriage of the mother of the celebrated Flora Macdonald.* The Rev. L. Fison mentions the fictitious concealment of certain persons after the death of a Fijian chief. In one place the henchman of the chief keeps out of sight for a number of days after his master's burial. "He is supposed to vanish as completely as if he had been actually buried with the chief, (which probably was once the practice) and if any of the tribes-folk should happen to meet him he is invisible to them." The same shunning of observation and intercourse takes place on the part of the two head undertakers at Vunda, after their chief's burial, their term of enforced retirement being nominally a year. "They paint themselves black from head to foot and never take their walks abroad until after dark. If compelled to go outside during the day-time they cover themselves with a mat and nobody takes the slightest notice of them, in fact nobody is supposed to be able to see them. The fiction is kept up that they are invisible or rather non-existent."† The point of interest in these examples is, that people who have become obnoxious to their kinsmen are regarded as out of the way, and if seen are not *perceived*. The overlooking being suggestive of a former obligation to take satisfaction. Surely some such obligation as this explains the repugnance, which a wife's friends are fictitiously regarded as bearing to her husband, more satisfactorily than does the abomination of incest.

It is interesting to note that the New Hebrideans allege that the reason for a man and his wife's relatives keeping apart is that if they touched each other they would "become poor."‡ Mr. MacDonald thinks that the poverty would be originally supposed to be the curse of heaven upon incest. The explanation is purely conjectural. It appears that the Efatese wife is purchased from her parents, and that after the death of her husband she may be disposed of by his friends, but not returned to her parents until they refund the price that was paid for her. Thus the present facts of the transaction do not suffice to account for keeping apart from the dread of contact causing poverty, and the reason for separation must be looked for in customs antecedent to those now in vogue.

Subjection to certain rites marks transition periods in the life of the young. Among some tribes there is a series of practices to be complied with by the youths, beginning when they are seven years of age and ending with their full initiation into manhood.

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* For evidence relating to the practice of capturing wives the reader is referred to McLennan's Studies in Ancient History, pp. 31–49.

† Fison, Burial Customs of Fiji, Centennial Magazine, Feby. 1889.

‡ MacDonald, Oceania, p. 182.

The man-making is a universal Australian observance, and is attended with more or less ritual and severity, and sometimes cruelty, according to the tribe. The initiation to manhood was generally the occasion of immense gatherings to a particular sacred spot. There was commonly a large circle* made, with not infrequently a gigantic human figure sketched upon the ground within the circle, but there was besides a secret place adjoining, where the more important and solemn part of the ceremony was conducted. The natives had the greatest reluctance to admit Europeans to witness the proceedings on these occasions, and if by chance one should be present at the large circle he would usually be absolutely forbidden to approach the more secret place. Almost every tribe had details in the man-making ceremonies peculiar to itself. The neophyte was generally required to keep serious and still, all levity being strictly prohibited ; he was sometimes obliged to fast, and various devices were employed to test his courage. After the ordeal had been successfully submitted to he was eligible for marriage. At the rite of initiation a chip of wood like the toy bull-roarer was called into requisition, as were also the sacred pebbles.

Mutilations of some kind or some cutting of the flesh are everywhere practiced. These vary with different tribes. Piercing the septum of the nose is the most common practice of the kind. Circumcision of the young men prevails in the central zone from north to south. It was not observed by the aboriginal Papuans, for it is unknown in the coast district of West Australia, in Victoria, New South Wales, and the greater part of Queensland from the coast inward. The absence of it in fact is a mark of the indigenes. Of the inhabitants of Sumatra Marsden says,† "The boys are circumcised where Mohammedanism prevails, between the sixth and tenth year." In dealing with Australian art and religion, positive demonstration will be given of Sumatran intercourse and influence, and the perplexing question as to the origin of circumcision in Australia, is now I think, satisfactorily settled. Between Sumatra and Australia there is a clear waterway, which would be easily and rapidly traversed during the prevalence of the north-west trades. I am confident that circumcision has been introduced from that island along with certain religious or mythological ideas. This theory of its introduction explains its partial distribution and its entire absence in the more purely Papuan parts, and seriously affects Mr. Curr's ethnological division for which one of the leading principles was the presence or absence of

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* The ceremony was called by the Kabi people 'dhur,' which means a circle.

† History of Sumatra, p. 287.

this rite. This principle is manifestly misleading. The distribution of this rite serves however to show how either an invasion or an influence from the north would most easily spread. All Australia would probably in time have been circumcised but for British settlement.

The amputation of one or two joints of the little finger of one hand is practiced upon the young women of some tribes on the Queensland coast,* a form of mutilation followed by some of the Kanakas of the New Hebrides. The knocking out of front teeth one, two, or four according to the tribe, is an old-world barbarity which has been perpetuated here. A similar custom is prevalent in Sumatra where the women have their teeth rubbed or filed down. But the most horrible of all the mutilations is that which Mr. Curr has designated "the terrible rite," it is inflicted with a flint, and for the purpose of rendering coition impossible. This bloody concision is done within the area where circumcision occurs, but is not so widely practised.† It probably arose from witnessing the disabling effects of circumcision, an apposite reference is the behaviour of Jacob's sons to the Shechemites.‡

The ornamentation of the body by cicatrices has already been referred to, and needs only to be mentioned here. What the writer has seen done has been solely for adornment, but it has been alleged that the pattern of the incisions serves in some cases as a tribal or gentile badge, (an allegation well confirmed,) or as a mark of rank,§ although what rank an aborigine could claim I cannot conceive. These incisions are another link relating the Australians both to the Polynesians and the people of India.

Nothing could exceed the dolefulness of the lamentations made for the dead. The crying is as much like the howling of the dingo as the wailing of human beings. It is carried on vigorously and persistently for weeks after the decease and then broken off by occasional crying fits. Very commonly the corpse is flayed and certain portions of the flesh eaten. Some parts of the body will be preserved and carried about as relics or charms, such as the knee-caps, the shin-bone, the hand, the skin. In Gippsland the hand of a dead person is worn round the neck as a charm and as an instrument of sorcery, a practice similar to the preservation of the finger-nails (and portions of the fingers attached) of a deceased

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* A practice similar to this once prevailed in Japan, but has been suppressed by Government and survives now only in fiction. The extreme phalanges of the third and fourth fingers of the right hand of a mother were amputated before her daughter attained the age of twelve or thirteen.

† Curr, The Australian Race, Vol. I., p. 74, and also map.

‡ Gen. xxxiv.

§ Dr. Carroll, Centennial Magazine for Oct. 1888. The present writer has personal testimony that tribes wear distinctive scars but he has not been able to verify the statement.

person by the New Hebrideans. Mothers will carry the dead bodies of their children on their march, even in a putrifying state. This according to Mr. Curr, is also a kind of penalty inflicted upon young mothers who are blamed for causing their baby's death by carelessness. The women especially cling affectionately to parts of the body of deceased relatives, a very creditable tenderness in those whose belief practically is that death ends all.

One mode of disposing of the dead is to bundle the bones into a hollow tree. I have found three or four tombs of this kind within an area of about four square miles. A practice followed on the east coast of Queensland and at a place so far distant as Encounter Bay, South Australia,* is to stretch the dead on an elevated platform of boughs until the corpse has become dessicated. A very general mode of burial is to prepare the body for interment by doubling the legs so that the knees will come under the chin; the hands are then tied by the side, and the corpse is placed in a grave, in this sitting position, head upwards. I am informed that on the Lachlan and Murrumbidgee the dead body was deposited with the head towards the south.† In the north of Queensland cemeteries are to be seen where there are accumulations of skulls.

Immediately after a death the camp at night is resonant with hideous sounds. When first I heard the howls of despair it made my very flesh creep with horror, and to heighten the effect the mourners might be seen the greater part of the night hurrying hither and thither brandishing torches, with the object it was said, I know not how credibly, of frightening away evil spirits. As might be expected the grave is very shallow. I have seen one in the Burnett District, Queensland, with several short logs placed at the side of it on the surface, which are said by the blacks to represent the number of brothers the deceased had, and to indicate by their position relatively to the corpse the direction in which the brothers resided.

Unless when the cause of death is very obvious, such as a spear-wound, it is laid to the charge of another blackfellow. Diverse methods are adopted for the discovery of the murderer. For instance, among the Kamilroi an ancient shin-bone relic wrapped in cord and some greasy matter, is held near a fire, and when it frizzles it is believed to point in the direction of the guilty party, who is then easily identified. In central Victoria a straw would sometimes be inserted in some small ant-hole or other perforation in the covering of the grave, and the direction in which the upper end would point would be the road to take to find the person who had caused the death. And then it might be the first blackfellow of another tribe who might be met, that would be slaughtered in

* At Encounter Bay after the flesh is decayed the bones are burned.

† My informant is Mr. Humphry Davy.

cold-blood in revenge. Capt. Grey testifies that among the blacks of Western Australia, the dread of blind vengeance on the occasion of a death, was extreme, because nothing could save an innocent person from being pounced upon either in obedience to some augury or for satisfaction of spite on the part of a sorcerer. The murderer had always to be sought for, and somebody would have to satisfy the demand. In many tribes the corpse is interrogated as to who was the cause of his death and responses are obtained generally by spells. While in the act of lamentation for the dead, the women would lacerate their bodies from head to foot till blood would be streaming from innumerable small incisions. The blood was allowed to dry upon the skin. The fact that this practice was forbidden to the Israelites shews its great antiquity.* Near relatives of the deceased wore some token of mourning upon the head, the usual practice being to attach tufts of emu's feathers to locks of the hair, and leave them to drop off of themselves. In some parts clay was plastered over a net upon the head and allowed to harden until the whole assumed the form of a skull-cap.† After being worn for a time it was laid upon the grave. Another custom in mourning was a prolonged abstinence from certain kinds of animal food.

Art, Corroborees, Sorceries, Superstitions.

The skill shown in the manufacture of weapons has been already noticed. These were often ornamented with rude colouring and carving. Some of the carvings appear to me to be imitations of letters, and perhaps a careful examination of very old choice specimens may result in an interpretation of the hieroglyph-like characters. A throwing-stick figured in Mr. Smyth's work‡ and spoken of by him in terms of warm approbation for its artistic merits bears engravings very like the Sumatran letters which will be referred to again below. I am strongly of opinion that the native message-sticks are imitations of the old Malay practice prevailing at least in Sumatra, of writing upon bamboo and rattan canes. It is very natural to suppose that isolated Malays dwelling among the Australians would endeavour to correspond with each other in this way, agreeably to the custom of their native land, and that the Australian aborigines observing that the characters were legible would readily imitate the more intelligent race. A careful preservation of old message-sticks is desirable, perhaps some may yet be discovered or may already be in our Museums or in private possession, bearing legible writing. Those now current

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* Deut. xiv., 1, Lev. xix., 28, etc. The making bald is forbidden in the same connection which is also an Australian sign of mourning.

† Curr, The Australian Race, Vol. II., p. 238.

‡ The Aborigines of Victoria, Vol. I., p. 308, fig. 88.

convey intelligence purely by sign-writing, not by alphabetical characters. The message-sticks vary in length from 1½ in. to the length of a walking-stick, the thickness is also variable, and the figuring consists of pits, notches, strokes, curves and zigzag lines. The inner side of the skins in opossum rugs was also scratched with rough representations of a few common objects, generally drawn in single lines.

Cave drawings and paintings have been discovered in various places, notably about the Gulf of Carpentaria, and the Glenelg River near the north-west coast of Australia. A great mystery has surrounded the clothed figures which Capt. Grey found* painted on the walls of caves on the Glenelg River in long. 125° 9′ E., lat. 15° 57½′ S. We can imagine how the gaudy-coloured, unearthly paintings would hover about the imagination of the explorer. They were situated chiefly in two caves about ten or twelve miles apart and comprised single figures and groups. They were done in blue, red, yellow, black, and white colours. One of the largest figures had a halo of wavy rays about the head like tongues of flame. The most important now, is that which has furnished the key to the nationality of the artist and the means of solving the enigma of authorship and significance. Various conjectures have been made regarding these paintings. So far back as 1846 Mr. Hall† identifies the special figure referred to above as Amoun, Cronus, Baal Astarte or Jupiter. He observes that a certain Hindoo on being shown a drawing of the figure called the person Kons, another Hindo called him Koodar or Kadar, which means God, and that a blackfellow named Yangalla *alias* Robert Cunningham, said it was a representation of Pundyil, the deity of the Victorian blacks. Mr. Brough Smyth states his opinion that with one doubtful exception these paintings are "the work of natives unassisted by any knowledge gained by intercourse with persons of a different race,"‡ and the doubtful exception is not the figure we are now considering. It has also been suggested that these figures were the work of Portuguese or Spaniards. The particular painting now under notice is a representation of a human figure, the height being 10 ft. 6 in. I was struck with the resemblance which certain characters on the head-dress of this figure § bore to the Sumatran alphabet, and was led to a diligent attempt to

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* Grey, North-west and Western Australia, Vol. i., pp. 214 and 250. Grey quotes appositely Ezek. xxiii., 14, 15, "For when she saw men pourtrayed upon the wall the images of the Chaldeans pourtrayed with vermilion &c."

† Remarks on the Probable Origin and Antiquity of the Aboriginal Natives of New South Wales.

‡ Aborigines of Victoria, Vol. i., p. 289.

§ Cf. Rev. xvii., 4–5—"And the woman was arrayed in purple and scarlet colour . . . . and upon her forehead was a name written "MYSTERY" &c.

decipher them which has resulted in success. By a careful comparison of the letters of the painting with the various types of Sumatran writing illustrated in V. D. Tuuk's *Les Manuscrits Lampongs* and other works, I made out the first four letters to spell 'Daibai.' Then searching for some such word or name as current in the home of the alphabet* I found the following observation in Marsden's History of Sumatra.† "They use both in Rejang and Passumarah the word 'dewa' to express a superior invisible class of beings, but each country acknowledges it to be of foreign derivation. . . . . The Battas, inhabitants of the northern end of Sumatra use the word 'daibattah' . . . the Cingalese 'dewiju,' the Telingas of India 'dai-wunda,' the Biajus of Borneo 'dewattah' &c., all these terms being names to express a deity or some degree of superior being." Having therefore spelt out Daibai I was evidently on the right track, and the following is the inscription with full interpretation :—

D AI B AI TA H

These characters with values assigned occur in *Les Manuscrits Lampongs* in the following places specially, but not exclusively by any means. The first character on pp. 64 and 101, the second, third and of course the fourth on pp. 56 and 101, in fact the third occurs all over, but with varying degrees of obliquity. The fifth character is the most doubtful of all. It might be either 'pa' or 'ta,' all that it requires to make it 'ta' in the regular Lampong writing is a light top-stroke. The letter 'ta' is manifestly related in form to 'da.' The identification of the final letter was difficult, but on page 3 of V. D. Tuuk's *Les Manuscrits Lampongs* will be found a similar form with the value of 'h' the only difference being that the lines are not joined at the angle. The smaller size of the final letter and its resemblance to the sign for 'h,' which like the Lampong vowels generally, is smaller and more variable than the mutes, almost compel the conclusion that it represents 'h:' these references should be consulted in conjunction with the styles of alphabets given at the end of *Les Manuscrits Lampongs*. This painting therefore is a figure of Daibaitah a Sumatran supernatural being or deity corresponding to the Indian 'Daiva' Fate or Destiny. The name finds a parallel in our own word *divinity*, and the two words prove the penetrating power of religious ideas. It has been suggested to me by Prof. Odlum of the Wesleyan Methodist College, Japan, that the word 'Daibaitah' may be a

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* There are three main types of writing in Sumatra, the Rejang, Lampong, and Battak, all derived evidently from one source, probably the Phœnician alphabet.

† History of Sumatra, p. 290.

form of 'Daibutsu' (translated Great Buddha) the name by which the great Japanese bronze image of Buddha (44ft in height) is known. There is thus open an alternative derivation both of the figure and its name. I prefer to derive from Indian sources. It is just possible that the current etymology of the Japanese word may not be correct.

Five of the other paintings which Sir George Grey saw are doubtless figures of supernatural beings also. Several of them are ornamented with marks after the style of cuneiform writing. If these marks were not copied with strictest care future examination may prove them to be also decipherable. On the right of the figure of Daibaitah are three rows of rings. Dr. Adam Clarke says that the OO among the Hindoos is a mystic symbol of the deity, signifying silence. My impression is that these works of art are comparatively modern. I am indebted to Mr. W. W. Froggatt of Sydney, for the following particulars bearing upon these cave-paintings. He was in the locality where they are found, as recently as 1887-8. He does not appear to have seen the pictures figured by Grey, but two similar ones, besides numerous representations of animals. The natives call them pictures of 'Nourie,' the 'Nouries' are black, evil spirits, of whom the aborigines are afraid. Mr. Froggatt thinks the pictures are modern, and done by the natives, because fresh sketches are added. It is quite natural to suppose that the natives would imitate the original paintings, but their ignorance of the personality of the first artist leads one to fix the date of the oldest paintings at least more than three generations back. The paintings of animals seen by Flinders and his company on the rocks on Chasm Island, and by Cunningham on Clark's Island are evidently by artists of the same race. Among the figures which Flinder's* party saw was a human hand presumably in red. Grey found a hand and arm done in black. These hands occur, done sometimes in black but mostly in red, all over Australia. Mr. Curr has seen the blacks making such impressions for pastime and he is of opinion that others which have been observed may be also modern, and of no special significance. From the occurrence of these 'red hands' in places very far apart and from the peculiar position and arrangement of groups of them,† I cannot help concluding that they are in the first instance sacred symbols, however frivolously they may have been imitated by blacks who had lost the meaning of them.

In the neighbourhood of Sydney there are numerous carvings of animals and other objects upon the sandstone rock. Men, fishes, boomerangs, spears, hatchets, are all delineated, and generally not

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* Voyages, Vol. II., pp. 188–189.

† Dr. Carroll's paper, "The Carved and Painted Rocks of Australia," Centennial Magazine, Oct. 1888.

in single representations but in groups, and manifestly with the aim of conveying some kind of knowledge. Dr. Carroll referred to above, undertakes to explain these, but his interpretation is clearly mere conjecture, and has little to recommend it beyond possibility. When for instance, he distinguishes between ancient and modern carvings by the fact that one set is overgrown with mosses, and the other not, he is plainly quite astray. Whether a stone be bare or clothed with moss or lichens, after the lapse of say, fifty years from the time of its exposure, will be determined by its grain, hardness and position. It is common enough to see on one side of a road-cutting basaltic rock overgrown with lichens, while the same rock on the opposite side may be naked. That these rock carvings were symbolical is almost beyond question, and they have parallels in workmanship, although not in subjects, in carvings that occur upon rocks in the South Sea Islands. Sir George Grey also speaks of a head carved by scooping the rock, seen by him near the caves on the Glenelg River, a unique work.

The Australian Muse is cultivated enthusiastically but unprogressively. The native in this respect, as in every other way, is conservative to the backbone, so that we have no reason to suppose that his music and song of to day is any advance upon what it was three thousand years ago. In some cases the words seem designed to run in rhymes, but a decided rhythm recurring in lines of regular length and invariably chanted, never recited, is the essential character of Australian poetry. Almost every blackfellow is a 'maker' of lyric verse, and whiles away the hour with his own compositions about any subject which lies closest to his heart, but the man who has the talent to compose a dramatic corroboree is a person of no small consequence.

The rendering of a corroboree is an occasion of the most intense enjoyment. The males are usually the sole performers the women sitting in front by the fires and beating time by striking two sticks together or beating with their hands upon stretched opossum skin or on the hollow of the thighs formed by the sitting posture. The dancers are smeared with red or yellow clay, or with pipeclay, in patterns that give them a frightful and sometimes a ghastly appearance. Occasionally the limbs are decked with light sprays. A customary movement is a shaking of the legs and a wriggling of the body. There is a tramping time to the music and a scarcely recognizable representation of some action. Some corroborees are lewd in the extreme, and it is generally understood that at such times sexual restrictions are shamefully, or from the native point of view shamelessly relaxed. Popular corroborees are transmitted from tribe to tribe and sung where not a word of them is understood. The melody moves at times very *andante*, and the very same sounds after a signal given will be sung in the liveliest manner. The

modulation is exceeding easy and gradual, the music rising or falling by semitones, save when after a gradual descent, there is a sudden vocal leap of an octave upwards. The close of a piece will be indicated by three great yells which do duty for the crashing music which is found indispensable to finish off most of the compositions in the repertoire of civilization.

The greatest bane of aboriginal life as of all savage life is sorcery. People reared in absolute ignorance of its bloody tyranny are unable to understand why the old Mosaic enactments should be so severe against its practice, but the necessity for such severity lies in the diabolical character of the thing itself and the proneness of the human mind to submit to its thraldom. It may be truthfully affirmed that there was not a solitary aborigine who did not believe as firmly in the power of sorcery as in his own existence, and while anybody could practise it to a limited extent, there were in every community a few men who excelled in pretension to skill in the art.

The titles of these magicians varied with the community, but by unanimous consent the whites have called them "doctors," and they correspond to the medicine-men and rain-makers of other barbarous nations. The power of the doctor is only circumscribed by the range of his fancy. He communes with spirits, takes aërial flights at pleasure, kills or cures, is invulnerable and invisible at will, and controls the elements. I remember a little black boy, when angry, threatening me with getting his father to set the thunder and lightning agoing. The same boy told me seriously that on the occasion of a raid being made upon the blacks' camp by the native police, one of his fathers—a doctor—lifted him and pitched him a mile or two into the scrub, and vanishing underground himself, reappeared at the spot where the boy alighted. The doctor has great healing skill A common exercise of this is to extract some object from the seat of pain by sucking. The object may be a piece of glass, or a plug of tobacco, or a half-brick. I do not know whether there is any uniformity of belief as to what confers the special gift of sorcery, but the opinion of the Kabi community (Queensland) was distinct enough. The doctor might be, as one might say, of two degrees—a "kundīr bonggan," a sort of M.B., and a "mamngūr," a thorough M.D. A man's power in the occult art would appear to be proportioned to his vitality, and the degree of vitality which he possessed depended upon the number of sacred pebbles and the quantity of rope which he carried within him. One kind of sacred pebble was named "kundīr," and the man who had an abundance of them was called "kundīr bonggan" *(pebbles many)*, and was a doctor of the lower degree. The "mamngūr" was a step in advance. He had been a party to a barter with "dhakkan," *the rainbow*, and the latter had given him so much

rope for a number of pebbles, which he had taken from the man in exchange. This transaction took place while the black was in a deep sleep. He would be lying on the brink of a waterhole—the rainbow's abode. The rainbow would drag him under, effect the exchange, and deposit the man, now a "manngūr manngūr," on the bank again. The doctor carried his sacred apparatus in a small bag, which none but himself might venture to touch, for fear of sudden death. He could hang the bag up anywhere in full view, perfectly secure from interference; and slung it on his shoulder when on the move. Its contents would be a few pebbles, bits of glass, bones, hair, worsted made of fur, and perhaps excreta of his foes. Certainly not a very formidable artillery, but for him enough to kill at any distance. In fact sickness and death were usually attributed to the practice of sorcery. A blackfellow gets a stitch in his side, and immediately he believes that an enemy has cast a pebble at him from behind a tree. The reasoning process is simple. The law of causation requires a cause for everything, and as a man would not get ill of himself, an enemy must be at the bottom of any hurt which he sustains. There was an interminable process of mutual revenge going on between neighbouring tribes, and the blow of the club would respond to the challenge which had come in the form of sickness from sorcery.

There are, or were, numerous superstitions of the nature of religious belief, inasmuch as they acknowledge invisible supernatural powers and beings. The blackfellow lived and moved and had his being in superstition. Unseen instruments and agents were continually at work. Disease would result from violation of rules, as for instance from eating prohibited food. To obtain possession of a person's hair or ordure, was to ensure his death. He declined as these decayed. It was dangerous to pass under a leaning tree or fence. The reason alleged for caution in this respect was that a woman might have been on the tree or fence, and that blood from her might have fallen upon it. This would seem to point to former regulations regarding pollution. But it may be the Australian form of the *mana* superstition, said* to be a sure mark of the Polynesian race.

Akin to this dread of passing under an elevated object, and due no doubt to the same cause, is the fear of another person stepping over one's body. Both these superstitions indicate the belief that a baneful influence of some kind is liable to fall from a person, and this influence was probably supposed to be due to some emanation like the *mana* of the Fijians.

The objection to pronounce the names of dead people has been noticed by most writers on the Australian race. The aversion

* By Rev. L. Fison, M.A., Centennial Magazine, Feb. 1889, p. 457.

would seem to be the result of a kind of *realism* among the natives, whereby a person's name became through confusion of thought the same as himself.

The veneration of pebbles has already been noticed. It has been remarked that the blacks were exceedingly loth to permit white men to see their sacred objects, and they were also concealed from their own countrywomen. There were local preferences for certain kinds of pebbles, but in general they appear to have been simply smooth rounded quartz stones.

The Rev. J. G. Paton secured a small piece of wood painted red at one end which he says is similar to one kind of idol worshipped by the New Hebrideans. Mr. Taplin describes* a practice of sorcery called 'ngadhungi' followed among the Narrinyeri, which bears upon the significance of the piece of stick coloured red at one end. A bone forming the remains of a repast of some native is secured and scraped. "A small lump is made by mixing a little fish-oil and *red ochre* into a paste and enclosing in it the eye of a Murray Cod, and the small piece of the flesh of a dead human body. This lump is *stuck on the top of the bone* and a covering tied over it, and it is put in the bosom of a corpse that it may derive deadly potency by contact with corruption, after it has remained there for some time it is considered fit for use. Should circumstances arise to excite the resentment of the disease-maker towards the person who ate the flesh of the animal from which the bone was taken, he immediately sticks the bone in the ground near the fire, so that the lump may melt away gradually. The entire melting and dropping off of the lump is supposed to cause death." Could human ingenuity be exercised in a manner more sickening, horrifying and repulsive? A similar demand for the remains of food or other refuse, of what a person has used is a trait of South Sea Island superstition. Although there is great dissimilarity in language between the Polynesians and Australians, such common traits as a community in objects of worship bespeak a close connection at some time. History proves how easily a form of worship may be superposed upon existing forms whereas it invariably requires violent causes to change language by the substitution of one tongue for another. It might therefore be the case that such resemblances might be due to like transitory causes or say to the drifting of a few Kanaka canoes to Australian shores although from the fact that stones were objects of veneration among the Tasmanians the inference would be that this at least was a superstition common to all primitive Papuans.

The Australians have what may be termed an apprehension of ghosts rather than a belief in them, the relations of the living

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* Native Tribes of South Australia, p. 24.

with the spirits being more or less intimate in different tribes. In the tribe with which I was best acquainted, while the blacks had a term for ghost and believed that there were departed spirits who were sometimes to be seen among the foliage, individual men would tell you upon enquiry that they believed that death was the last of them. In other words, a man's personality died with his body and was not continued in his ghost. A ghost was called a 'shadow' and the conception of its existence was shadowy like itself. A general feature of Australian mythology is the peopling of deep waterholes with indescribable spirits. The Kabi tribe deified the rainbow, a superstition apparently confined to this people. He lived in unfathomable waterholes on the mountains, and when visible was in the act of passing from one haunt to another. He was accredited with exchanging children after the fashion of the European fays. He was also a great bestower of vitality which he imparted in the form of rope (what this rope was I do not know) in the manner explained above.

Many tribes revered the names of ancient heroes or demigods who were credited with certain wonderful exploits, and who generally became metamorphosed into stars. The conception of a supreme being oscillated between a hero and a deity. Some tribes recognized both a supreme good spirit and a powerful, dreaded, evil spirit, creation being ascribed to the former. I was once of opinion that notions about a divinity had been derived from the whites and transmitted amongst the blacks hither and thither, but I am now convinced that this belief was here before European occupation. Although not entertained by every tribe it is nevertheless held by one tribe or another in the south-east quarter of the continent from the coast almost to the centre, and we are justified in concluding that it extends beyond the area where it is positively known to exist.

By those who have been eager to establish the theory that there are atheistic races of men the Australians have been cited as an example, another instance of the unreliability and invalidity of a deduction from negative evidence. Among the Kamilroi and allied tribes to the north of New South Wales the character of a beneficent deity known as Baiame has been well elaborated. The name, according to the Rev. W. Ridley, is derived from 'baia' *to make or build by chopping*. Baiame is the creator and preserver. The Wiradhuri regarded him under a slightly altered name, Baiamai, as eternal, omnipotent and good. A supreme deity was known by the name of Anambu or Minumbu by the Pikumbul tribe; at Illawarra he was called Mirirul, on the Murray Nourelle, in Victoria he was generally known as Bundjil or Pundyil, and also as Gnowdenont; the Narrinyeri as we have seen called him

Nurandere and sometimes Martummere, and by the Diyeri he was known as Mooramoora.

Dr. Lang* observes, "There are certain traditions among the aborigines that appear to me to have somewhat of an Asiatic character and aspect. Buddai, or as it is pronounced by the aborigines towards the mountains in the Moreton Bay district Budjah, (*quasi* Buddah) they regard as a common ancestor of their race, and describe as an old man of great stature, who has been asleep for ages." The question may be reasonably asked is this Buddai not as likely to refer to Daibaitah of the north-west as to Budha? If Daibaitah be derived from Japan through Sumatra then both names may be echoes of Budha. In New Guinea, according to Marsden, the same deity is known as 'Wat,' the first and third syllables of the name being lopped off. And further may it not be possible that Baiame of New South Wales and Pundyil of Victoria refer to the same supernatural being. Baiame may indeed be a local equivalent of Barma another Sumatran deity. The blackfellow Yangalla already mentioned recognized Daibaitah as Pundyil, the resemblance may have been due to a certain impression that both were supernatural beings, but on the other hand the names may be etymologically related, and if so a unity is given to the native belief in a divinity.

The myths regarding the creation are numerous, and there are some which refer to a flood, but there is no common fixed account of either event and both classes of myths may be quite modern, the one being an attempt to explain the world's origin, and so far a reflection of the workings of the native mind, the other a recollection of an unprecedented local downpour of rain and consequent inundation. I confess to having failed to obtain in the south of Queensland any myth about the creation or the flood, the nearest approach to an account of the former was the personal conjecture which a blackfellow made regarding the origin of his race, which was that he thought they had sprung up like the trees, uncommonly like Topsy's "I specs I grow'd."

Australian Languages.

There is need for extreme caution in making sweeping general statements regarding the languages of Australia, because they are liable to be invalidated at any time by the discovery of particular contradictory instances. The judgment of the very highest authorities is subject to be shaken by exceptions. For instance, in the Reise der Fregatte Novara, p. 244, Dr. F. Müller says that the aspirates 'h' and 'v' are wanting, whereas there are undoubted though rare cases of their occurrence. On the same page he says

* Queensland, Australia, p. 379.

that these languages possess only post-positions and that they have no distinction for gender, whereas there are instances of prefixes and infixes as well as post positions, and some dialects have phonic marks to distinguish sex. When therefore any character is affirmed to be universally true of Australian languages, the statement must imply the reservation that there may be exceptions, until at least all the various dialects have been reduced to writing and brought under survey.

Dr. Bleek has classified the Australian Languages in the following manner :—

I. Northern Division.

II. Southern Division { 1 Western. 2 Middle. 3 Eastern.

III. Tasmanian.

No exception can be taken to giving Tasmanian dialects a place by themselves, but the other part of the classification is too loose and arbitrary, and altogether unsatisfactory. It should be borne in mind that at least one-third of Australia is a *terra incognita* to the philologist, the unknown part embracing nearly all the western half of the continent, excepting a strip along the coast. Very important ethnological revelations may be awaiting disclosure there. As a rough geographical classification based upon our present knowledge I would suggest the following :—

I. Western—Dialects of West Coast.

II. Central { 1 Dialects of North Coast. 2 Dialects of Centre. 3 Dialects of South Coast.

III. Eastern { 1 Dialects of Northern Queensland. 2 Dialects of South Queensland, New South Wales and part of South Australia. 3 Dialects of Victoria and Riverina.

IV. Tasmanian.

However, the writer is far from being satisfied with a merely local classification, and would prefer one upon a different basis. Mr. Curr's arrangement of tribes would be very helpful to a classification of dialects. Leading words such as terms for man, father, head, and the numerals might be combined with phonesis and structure as a basis for a natural classification. It seems to me that for such a purpose the words in use for *man* are of paramount importance. These may be reduced to about seven forms viz., 1 Youngar ; 2, Meening, Meyne or Mine ; 3, Kurna, Yura, Tura or Kooli &c. ; 4, Wimbaja ; 5, Murrai ; 6, Dhan ; 7, Beang, Binna or Bamma &c. Of these names Wimbaja and Dhan are comparatively local, the others crop up in unexpected places giving

evidence to winding, widespread, wanderings of the families which they designate.

The Kurna, Murrai and Wimbaja are doubtless among the later arrivals on the continent, who whether of one family originally or not, have penetrated southwards through the centre of Australia, probably in the order in which they are here named. The seven families above enumerated, with perhaps several others have mingled and re-mingled until it has become almost impossible to distinguish their characteristics and disentangle their original tongues. As an illustration of how such an unravelling might be effected, let me point out that the Bamma people have generally the word for father of the 'kaia' or 'nunchun' type, the Youngar have it of the 'mama' type, the Murrai and Dhan have the same term of the 'yabu' or 'babu' type, and the Kurna except in the Victorian Region have it of the 'api' or 'pappi' type. A large number of generalizations of this kind, the distinctions of families and types of words being kept in view would I venture to say be of very great value.

Notable diversities in words and structure are due in the main to dissimilarity of original elements, while the shading of dialects into one another must be ascribed to the influence of exogamy. Almost everywhere throughout the continent original elements are observable protruding through the more recent, like primary rocks through all later formations.

It may yet be possible to classify the Australian languages on the basis of racial predominance and phonesis, in which case Western Australia, Victoria, and Tasmania would probably be bracketed together. There is at least a very marked contrast in phonesis between the dialects of Queensland, New South Wales and Central Australia on the one hand and those of Western Australia, Victoria and Tasmania on the other. If it be asked, what view of Australian settlement does a study of language lead to? The reply must be that a general survey of the languages favours the conclusion that there was at first a comparative homogeneity of speech in Australia and Tasmania of simple structure as exhibited in Tasmanian and Western Australian dialects, but that there poured in from the north streams of population with a speech more elaborate in construction. Parallel north and south strips of homogeneous people still testify to this migration from the north, and the general brokenness of language along the coast betokens disturbing and overlying influences from the landward streams, and in some cases most certainly through settlements of people who have come not overland but by sea.

The fundamental principle of word-structure is agglutination. There is therefore a general well-marked relationship with the members of the Turanian branch of human speech, with one single

contrast, viz.. the absence of the law of Vocalic Harmony. The usual form of modification is by post-positions, but this mode is by no means invariable, it is supplemented in many dialects by pre-formatives and sometimes by included particles. Genuine internal vowel inflection is not observed. Certain languages lean almost as much to external inflection as to agglutination and tend to analytic structure. Others are fairly perfect specimens of agglutination. So far as I know the simplest and most analytic language is that current in Western Australia, the most complex, if it have not a rival on the Daly River, is at Lake Macquarie at the other extreme of the continent, and between the east and west extremes the languages increase in complexity and fineness of elaboration from west to east. This does not involve the inference that a process of modification proceeded latitudinally along the continent because to set over against such a supposition is the fact that parallel lines of language, as of race, run longitudinally. The speech of Western Australia might be taken as the extreme of simplicity, a dialect of New South Wales or Southern Queensland as the extreme of elaboration, while the language of the Diyeri lying about half-way between is simple in structure but richly compounding.

In nouns and adjectives there is a conspicuous abundance of dissyllabic words as in the South Sea Island languages. In many cases I am convinced that these are a combination of two roots, the original sense of one syllable being lost or the sense of both transmuted. For instance take the word 'wulwi' *smoke* in the Kabi dialect, neither of the syllables separate has any meaning in Kabi, but in other parts 'wolla' is *rain*, and 'wi' is *fire*, so that 'wulwi' meant originally *rain of fire*. Decomposition after this manner would no doubt throw much light upon the primitive speech. The phonic system embraces all the pure vowels; the modifications expressed in German by ä, ö, and ü being also used by certain European writers. All possible diphthongal combinations are employed in one dialect or another. The consonants found invariably are k, t, p, ng, ñ, n, m, y, w, r, l. Owing to a common imperfect enunciation of the mutes, some are doubtful whether g, d, and b can be credited to Australian languages. The most certain proof, to my mind, that these sonants should be included in a complete summary is a remarkable unanimity in foreign ears recognizing them in certain words, as for instance in 'bulla' *two*, 'barang' a class-name. Besides the foregoing there are the aspirates 'dh,' 'th' (as in English father) and 'v;' there is a cerebral 'r,' which I shall mark 'rr,' a conjunction of 'dy' and of 'ty' approaching so nearly to English 'j' and palatal 'ch' as to be expressed sometimes by these. The aspirate 'h' occurs, but is extremely

rare, and the rushing sonant 'gh' is written in some Victorian dialects as also in Tasmanian. Sibilants are unknown.

An aversion to 'r' and 'l' as initial letters is very common. In several New South Wales and Queensland dialects these letters never begin a word. Introductory vowels are also generally avoided, if occurring in considerable number in any dialect the peculiarity becomes a differential feature. Any of the consonants other than the liquids 'l' and 'r' may commence a word in all dialects where they certainly exist. The nasal 'ng' and a consonant followed by a furtive 'y' like 'ly,' 'ty,' (mouillé consonants) are common initial letters. Initial combinations in words or syllables such as 'kr,' 'gr,' 'dr' are generally disliked, and where frequent, as for instance in Victoria, are primitive Papuan n arks. In the central eastern dialects, *i.e.*, those of New South Wales, Southern Queensland and Central South Australia, such forms are exceedingly rare, and even where they appear to exist there is a disposition to interpose a short vowel. In the smoother languages of the east the possible terminal letters are usually limited to the liquids, 'ng,' 'ndh' (a dentated 'n') and vowels. In Victoria and West Australia words may end in any consonants and vowels, nor are such terminal combinations as 'rk,' 'rn,' 'rt' objectionable, another evidence of the closer alliance between the languages of these places. Another rough mark of relationship in the Victorian and West Australian languages is the admission of closed syllables in any part of a word, an exception to the general rule which is a preference for open syllables, unless either a liquid be the closing letter, or the final letter of one syllable be also the initial letter of the succeeding, an exceedingly common character, in which case both letters are distinctly enunciated, *e.g.* 'kokka,' 'kakkal.' The accent usually falls upon the first syllable, which is also the main radical. A circumstance which has greatly hindered our acquisition of a perfect knowledge of Australian languages is, that except the enquirer be a philologist, we bring in to the study our European ideas of language, and endeavour to force aboriginal forms into European grammatical moulds, a practice which should be at once discarded as it cramps all enquiry. It does great injustice to the native languages, on the one hand making them appear extremely rudimentary and on the other leaving many verbal forms unexplained.

Words.

It is a common assertion that in Australian languages single words carry nothing in themselves whereby they may be distinguished as parts of speech. This rough generalization is not absolutely correct. In Kabi for instance, there are several special adjectival terminations which mark the adjective, and which in some cases have become inseparably affixed. And there is in most

languages a distinct verbal sign, which in some of them is as much incorporated in the word as '-are' in Latin 'amare.' As a general rule, likewise, interrogative pronouns and interrogative adverbs are marked, if not by a peculiar termination, at any rate by a distinctive initial syllable.

There are numerous particles employed in various ways and positions with modifying force, *e.g.*, the word 'kna' used in West Australia as the last word in a sentence to ask a question, with a value something like the English *eh?* Compare also the particle 'ya' used in the Kabi dialect of the extreme east with a meaning like *come now!* Besides floating independent particles of this class there are those attached sometimes to a phrase to give it a substantive value, like the word 'midde' in Western Australia, meaning the agent. It is said that all verbs may be rendered nouns by the addition of this particle. Of this more fixed and dependent class the modifying syllables attached to verbs may be cited as examples. These are probably words like 'midde' but of which the identity and original sense are in all stages of evanescence.

General consent denies an article, properly so called, to Australian languages. Doubtless the numeral *one* and the demonstratives *this* or *that* can be filled in to satisfy a demand for an equivalent to *a* or *the*. And Mr. Thomas* gives an enclitic -arter and -o as elegant definitives for *the*. But these probably mean more. There is one feature of certain dialects however, to which I would call attention. It is the disposition to introduce an initial vowel which may possibly be explained as a trace of the equivalent of what has been called in other languages such as the Malay *the unconscious article*. This introductory vowel has the effect sometimes of disguising the word and masking analogies, and it is generally united to the stem by a liquid 'r' 'l' or 'n.' The best examples of this are to be found in the most central dialects which we have any knowledge of, vocabularies of which are given by Mr. E. M. Curr,† received from Alice Springs and Charlotte Waters Telegraph Stations and from the Macumba River. There is a similar peculiarity in a dialect of the Palmer River,‡ but there it is excessive. At Alice Springs such words occur as 'arkoppita' *head*, 'ulgana' *eye*, 'iniga' *foot*. Now the writer does not assert that in all cases the initial vowel is an unconscious article because in some cases it evidently is not, as for instance, when it begins a verb, but he merely suggests the possibility that the original possession of an article may have imparted this trick of an introductory vowel so rare in other parts. And he desires to point out that this peculiarity of a prosthetic vowel is a distinguishing

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* Smyth, The Aborigines of Victoria, Vol. II., p. 118.

† Curr, The Australian Race, Vol. I., pp. 412, 425; ‡ Vol. II., p. 398.

characteristic of the dialects named, which though spoken at places five or six hundred miles apart with different dialects intervening are evidently of one family. The same type of dialect is spoken on the Norman River.

Number is rarely marked save by distinct words. There are however exceptions. In the speech of the Narrinyeri (South Australia) the plural is indicated by a special terminal inflection, *e.g.*, 'korni' *a man*, dual 'kornengk' *two men*, plural 'kornar' *men*. In the verb, number receives no sound mark. A fallacious notion which has been widely circulated may here be referred to with the view of exposing it. The Australians it is said have no general names but only special terms. There are scores of words in every dialect testifying to the contrary. Take the Kabi dialect as an example it has a general name for animal, man, tree, stone, creek, mountain, and so forth. The only grounds for the delusion referred to are the facts that some classes of objects have not been generalized and that there is a preference for the special distinctive name, even where a general one exists. Thus instead of speaking of a tree, the native prefers to specialize the particular kind of tree.

Gender is commonly distinguished by the addition of a word signifying male, female, man, mother, or the like, but in special classes of words such as the phratric names there are occasionally terminations distinctive of sex, as for instance about Brisbane, Queensland, 'barang' a male of the class 'barang,' 'baranggan' a female of the same class. But the most striking case of phonic indication of gender comes from the Daly River. I am sorry to be unable to give my informant's name as my information came indirectly, but I believe he is a member of the Roman Catholic Mission at that place and I hope he will publish a memoir upon the very interesting dialect of which I have received a sketch and a vocabulary. In the dialect referred to, which is known as the Daktyerat and is spoken on the left bank of the Daly River, Northern Territory, four genders are distinguished in nouns, adjectives, and verbs, *viz.*, masculine, feminine, neuter, and common. The general distinctive marks being 'y,' 'n,' 'w,' and 'm,' respectively, with sometimes a following vowel, and these inflexions are initial in adjectives, *e.g.*, 'yidello' *a big (man)*, 'nudello' *a big (woman)*, 'wudello' *a big (thing)*, sex not distinguished, 'mudello' *a big (object of any gender)*. These marks are probably the consonantal radical of the third personal pronouns. In all the languages of more elaborate structure the noun is exceedingly rich in cases, and as a rule where these are said not to exist, the fact is that they have not been recognized. The cases comprise such as nominative, genitive, dative, accusative, ablative (instrumental) abessive, adessive, commorative, locative (with distinctions of *in, towards, from*).

The adjective is usually compared by supplying an adverbial word with the sense of *very;* frequently comparison is effected by reduplication, complete or partial, the superlative being sometimes marked by a reiteration of the duplicated syllable, cf. 'worbrinun' *tired;* 'worbrinunun, *very tired;* 'worbrinumunun,' *excessively tired—regularly done.** This hanging on a letter or syllable also implies continuity or intensity in the meaning of the verb in some dialects. Another mode of comparison in adjectives is by singling out that object which surpasses the other or others, and saying 'this big' 'this good' and so on. In opposition to the view that a word may be a noun or adjective indifferently by tacking on or omitting the case endings, and that there is no difference in form I repeat what I have already remarked, that this is not invariably true, that for instance there are certain recognisable adjectival terminations such as '-ngur' in the Kabi dialect although they are affixed to only a limited number of words. This however is to be observed that in Kabi, nouns may become adjectives by the addition of '-ngur' just as in English by affixing -like, in German -ig.

The system of notation has been already referred to and I only mention it here to remark that the term for *one* varies exceedingly, while that for two is very uniform and reducible to about three or four different types which may help to tell the tale of origin. The three main types are in English spelling, 'kootal' in the west, 'barkool' across the centre from north to south, 'boolla' in the east, also reaching from north to south. 'Kootal' prevails in my Western Division, 'barkool' and 'boolla' are both embraced in the Eastern, while the form in the Central is not determined. 'Boolla' I believe to be of Papuan, 'barkool' of Indian origin.

The pronouns are specially remarkable for the almost universal currency of certain forms, both of stem and (less uniformly) of case-ending, notably those of the first and second persons singular. The first and second persons singular are generally of the central Indian 'nan-nin' type ('ngan-ngin' rather in Australia) in some cases the plural has the same base as the singular, with generally a syllable marked by the letter 'l' to indicate plurality, this also being an Indian feature. In the first and second persons there is usually a dual, the first dual being, sometimes at least, such a compound as *we-thou*, the second the numeral *two*. In the West Australian speech different pairs are indicated by different details in the three persons significant of such relations as (1) husband and wife or people greatly attached, (2) parent and child, uncle and nephew, and the like, (3) brother and sister or a pair of friends.

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* Mode used by the Melbourne blacks, *vide* Smyth, The Aborigines of Victoria, Vol. II., p. 118.

There is usually no phonic connection between the third persons singular and plural, a common form of the third plural has the etymon 'than' or 'tin'; the distinction of sex is not usually marked in the pronoun though there are exceptions. Decayed pronouns are frequently incorporated with nouns to indicate possession in such forms as *father-my*, *father-your*, and also with verbs as the personal index not yet assimilated so as to obliterate the origin, and in such cases the position is usually terminal, though here again the case of Daktyerat dialect is a clear exception where the pronominal element may be either initial or medial. The pronoun is also well supplied with cases, and possessive forms are in some dialects capable of declension like nouns. Demonstrative pronouns are also declinable like the personal in certain dialects, as for example that of Lake Macquarie in New South Wales. The interrogative pronouns and interrogative adverbs may be mentioned together as having much in common. The radical elements are usually 'ngan' in *who* or *what*, 'wendy' in *where*, *when*, etc., 'miñ' in *how*, *why*, *how many*, *what*, etc. These are declined to correspond to a variety of shades of meaning, and they are among the most uniform and widespread words.

Prepositions can scarcely be said to exist except in the sense of preformatives; and where they are represented as being in use, as for instance, in the contribution to Mr. Brough Smyth's work of the language spoken at Lake Tyers, Gippsland, the statement is liable to arouse the suspicion that the idea of separate prepositions may be due to a straining to conform the native speech to European types. The conjunctions are few and connectives rarely employed, but adverbs are very numerous and appear in some instances, as in Kabi, to be formed from nouns after the manner of the formation of adjectives already cited, but with a peculiar adverbial ending.

The verb is the most complex and elaborate of all the parts of speech. So numerous and diverse are its modifications that they astonish and perplex the student and puzzle him in his endeavour to designate and classify. In fact European grammatical terms will not embrace them in their rich abundance, or to vary the figure, are insufficient to clothe them. We generally find English writers conjugating Australian verbs after the approved methods of English grammar, which is like an attempt to spell all the words in the English language by the use of only half-a-dozen letters. The verb has what may be called *forms*, such as simple, reflexive, reciprocal, and there are several *moods*, as optative, inceptive, infinitive, imperative. Then there are *tenses* in considerable variety, as for instance in the Wiradhuri, indefinite present, definite present, aorist, indefinite perfect, definite perfect, to day's perfect,

yesterday's perfect, distant perfect, and so on with future, until according to Dr. F. Müller, fourteen tenses are enumerated.*

This is of course a description of the most complex types, but the languages generally have such *forms*, *moods*, *tenses*, and *participles* besides, although in a great many dialects the number of changes is much more limited than in the Wiradhuri. And it is just possible that some writers have needlessly multiplied forms by incorporating with the verb, adverbs which should have been regarded as separate words. A caution must be given against supposing that the verbs are generally regular, so far as my personal experience goes, which is confined to the knowledge of one dialect *acquired directly from the blacks*, there is great irregularity and many verbs are defective. The position of words in the sentence is subject to considerable variation according to dialect. Commonly in categorical sentences the nominative comes first and is immediately followed by the object; qualifying words if present, succeeding their respective subjects; after the object comes the adverb and finally the verb.

Outlines of Grammar.

I now submit a brief outline of the grammatical forms of four different languages, the first representing the Western Division, the second and third representing the Central part of the Eastern Division, the fourth representing the Southern part of the Eastern Division, the part namely which is geographically embraced in Victoria and Riverina. Absolute consistency in spelling native names must not be expected.

I.—The Language of Western Australia.

Authorities: Capt. (now Sir George) Grey† and Mr. G. F. Moore.‡

This language is spoken in the neighbourhood of Perth, and with slight diversity in the greater part of the south-west of Western Australia. So far as appears it is the most rudimentary and analytic of Australian languages.

Phonic Element.

a ā â
e o ō ǫ (as in *not*)
i ī u ū
ai au oi ua uo
k g ng
t d tch or tz, dj y r l n ñ
p b v (in one word only) w m

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* Some dialects have an active and passive voice, as the Lake Macquarie, in which an incorporated pronominal element in the nominative indicates the active, a similar element in the accusative marks the passive.

† Vocabulary of the Dialects of South-West Australia. ‡ Ten Years in Western Australia.

There is an aversion to 'r' and 'l' at the beginning of words. The distinction between surd and sonant letters is undecided. The noun seems destitute of case endings. The names of social relations have a plural form in '-mun' if the singular end in a vowel, in '-gurra' if the singular end in a consonant; '-mun' is an abbreviation of 'munda' *altogether, collectively*, '-gurra' is probably derived from 'garro' *again*. 'Migalya' is the plural of 'migal' *a tear*. The comparative of adjectives is formed by reduplication, the superlative by the addition of '-jil' or '-buk.' The pronouns, besides three forms of dual for the three persons, have also a trinal number for the first person. Possessive pronouns are formed from the personal by affixing '-uk,' excepting in the second person singular. This -uk as a sign of possession unites the eastern and western languages. This affix effects the same result in compound expressions, where however it sometimes changes to '-ung.'

The verb is exceeding simple. The preterite is formed by adding '-ga,' the participle present by affixing '-een' or '-ween' to the present tense with the occasional interposition of a vowel at the junction thus—

present indicative yugow *stand*
preterite yugaga
present participle yugoween.

The preterite has three forms relating respectively to the immediate past, the sometime past and the remote past. These are distinguished by *prefixing* to the regular preterite the particles 'gori,' 'garum,' 'gora,' respectively. There are two futures, a near and a distant, distinguished by the words 'boorda' *presently*, and 'mela' *in the future*, which follow generally the infinitive mood, occasionally the present participle, but are not incorporated with the verb. The word 'ordak' signifying *to intend*, is also affixed to verbs to denote that the action is purposed. There is likewise a past participle which is not specified. There is no phonic mark of number in the verb. The different persons are indicated by employing the pronouns.

This language favours the combining of words to an almost indefinite extent. The word commonly employed to give unity to compounds is 'midde' *the agent* or *agency*, and all verbs may be rendered substantive by the addition of this word. For example 'yungar barrang midde' is *the horse*, or literally the *people-carrying agent*, 'mungyt barrang midde' the 'mung-yt' *-getting-agent* or *stick for hooking down the Banksia cones.*

There are combinations observable in the verb which seem elementary forms of the more complicated structure in the east of the continent thus—

'yugow-murrijo' (literally *to be, to go) to run*
'yugow-murrijobin,' *to run quickly*

'yulman' means *in turn, in return*
'wangow,' *to speak;* 'yulman-wangow,' *to answer*
'yonga' means *to give;* 'yulman-yonga,' *to exchange*

'yulman' is singularly like the reciprocal sign in the Eastern Division, which in Kabi for instance is 'yulaiyu,' but in the east it is affixed to the verbal stem.

PRONOUNS—*First Person.*

Singular.		Plural.
Nom. simple	nganya	ngannil
,, agent	adjo or nadju (ngadju ?)	ngadjul
Gen.	nganaluk, *also* nganna	nganiluk
Acc.	nganya	ngannil

Capt. Grey gave to nadju the sense of *I will*, but probably as in other cases it expresses the agent, a similar remark applies to the corresponding form in second person.

Second Person.

Nom. simple	nginni	nurang
,, agent	ñundu or ñundul	
Gen.	nunoluk	nuranguk, ngunullang, ngunaluk
Acc.	nginni	

Third Person.

Nom.	bal, *he, she, it*	balgun, bullalel
Gen.	baluk *her*, buggalong *his*	balgunuk
Acc.		balgup
Dat.	buggalo, *to him*, ballal, *he himself.*	

DUALS.

Brother and sister, etc.	Parent and child, etc.	Husband and wife, etc.
1st person ngalli	ngala	nganitch
2nd person ñubal	ñubal	ñubin
3rd person boola	boolala	boolane

ngannama *we two, (brothers-in-law).*

TRINAL 1st person, ngalata, *we three.*

Numerals.

There are only three numerals 'gain' or 'kain' *one*, 'gudjal' *two*, 'ngarril' or 'warring' *three.* Higher numbers are expressed by 'warring' *a few*, or 'boola' *many.* 'Boola' is evidently the same as the eastern term for *two*, as it is used for a dual pronoun.

Interrogatives—Pronouns.

Nom. simple	nganni, *who,*	nait, *what*
,, agent	ngando, ngandul, nginde	yan, ,,
Gen.	ngannong, *whose*	

Adverbs.

winji, winjala, (windyi, windyala) *where*
naitjak, *wherever.*

The Diyeri Language.

Authority: Mr. Samuel Gason's, The Dieyerie Tribe of Australian Aborigines.

The Diyeri language is spoken between Cooper's Creek and the north-east shore of Lake Torrens, in South Australia, but not far from the Queensland and New South Wales boundaries. Mr. Gason's vocabulary does not supply much data for arriving at the structure of sentences, the examples of syntax being unfortunately too meagre to admit of our deducing noun declension from them. The verb seems to be conjugated very simply and with a suspicious regularity. The language is of a very elementary, compounding character, and in this respect stands midway between the languages of the extreme west and east respectively, being more closely related to the latter, with which my classification joins it. The personal pronouns and some of the interrogative words unite both extremes with the mean. The reciprocal sign of the west 'yulman' is well worth comparing with 'mullauna' *one another* of the Diyeri, '-ulunni' of Kamilroi, 'yulaiyu' of Kabi. '-lan' of Lake Macquarie, and 'lana' of Wiradhuri, all reciprocal verbal signs, the Kabi and West Australian forms seem to give the original type as something like 'yulain,' which may be compounded of two pronouns 'ngali-ngin' *we-thee*, or the like. Diyeri is rich in determinant elements, easily recognizable and separable, and usually but not invariably post-formative.

Phonic Elements—Vowels.

a ā
e o o̱ (as in English *ton*)
i ī ū

diphthongs ai au

Consonants.

k g	h	ng
t d		l r y n
th ch		
p b		w m

The words terminate with *vowel sounds only*, they begin with vowels or consonants but the latter must be single. Such combinations occur internally as rd, rt, rk, kr, dr, ldr, ndr. Diyeri therefore agrees fairly in phonesis with the eastern languages generally, but is even smoother and more vocalic.

PRONOUNS—*First Person.*

Singular.	Plural.
Nom. (agent ?) athu,	ali, yana, uldra
Gen. ani	yanani, uldrani
Gen. or dat. akunga	
Acc. ani, ni	ali

Second Person.

Singular.	Dual.	Plural.
Nom. yondru	yula	yura, yini
Gen.		yinkani
Acc. ninna		

Third Person.

Singular.			Dual.	Plural.
Mas.	Feminine.	Neut.		
Nom. noalia,	nandroya	ninna,	bulyia	thana
Gen. nunkani	nankani			thanani
Gen. or dat.				wurra, wirri, yinkani
Acc. nulu	nania			thaniya

'ninna' is also demonstratie *this*.

There are definitive elements affixed to substantives to signify *my*, as 'api-ni' *my father*, '-ni' is a general genitive or possessive termination with '-li' as probably an alternative form.

Possessive forms are evidently declined, *e.g.* 'yinkari,' *yours*, 'yinkani-gu' *of or to yours*.

It is much to be regretted that data are lacking from which the declension of substantives might be tabulated. The noun is probably rich in cases as may be inferred from such compounds as the following, 'bumpu-nundra' *almost a blow*, 'nundra' *a blow* 'bumpu' *almost*; 'moa-pina' *very hungry*, 'moa' *hunger*, 'pina' *great*; 'kurnaundra' *relating to a blackfellow*, 'kurna' *blackfellow*, 'undra' *relating to*. A genitive is observable in '-lu' *e.g.* 'pinya' *armed party*, 'pinyalu' *of the armed party*.

Interrogative Words.

Nom. warana, *who*
Gen. wurni, wurniundru, *whose*
Acc. wurunga, *whom*
whi, *what*
wodau, *what, how*
wodani, *what is it like?*
wodaru, *what do you say?*
wodau, *how*
wodaunchu, *how many*
wintha, *when*
winthuri, *whence*
wodari, *where*
mina, *what*
minani, *what else*
minandru } *why*
minarnani }

Adjectives do not seem to be distinguishable by any vocal sign, but comparison is marked by added definitive elements, thus 'wurdu' *short*, 'murla' *more*, 'muthu' *most*, 'wurdu-murla' *shorter*, 'wurdu-muthu' *shortest*.

Notation.

'Curnu' *one*, 'mundru' *two*, 'paracula' *three*. The numeral system is virtually binary. Twenty is expressed by 'murrathidna' *hands-feet*, for any number over twenty an indefinite word signifying multitude is employed.

The Verb.

The structure of the verb so far as we can judge is exceedingly simple. To indicate the person the pronoun is prefixed unabridged. There are simple and reciprocal forms, the latter having the termination 'mullāna.' The simple form has infinitive, indicative, and imperative moods, and participles perfect and imperfect. The following is the conjugation of the verb 'yathami' *to speak*, parallel with which I place the Kabi verb 'yamathi' also meaning to speak in order to show the singular likeness and close relationship of the word and its modifications :—

Diyeri.	Kabi.
yathami, *to speak*	yamathi, *to speak*
yathunaori, *has spoken*	yamarandh } *spoken*
yathi, *have spoken*	ya'an } *spoken*
yathunawonthi, *had spoken*	wonai yamathi, *have done with speaking* !
yathulāni, *will speak*	yathin, *will speak*.
yathala, *speak*	ya, *speak*
yathamarau, *speak* (imperatively)	ya, yamorai (by analogy of other Kabi verbs) *speak* (imperatively)
yathuna, *speaking*	yathinba (by analogy as above) *speaking*.
yathamulkāna, *quarrelling together*.	yathulaiyu, *conversing*.

The stem radical of the above verb is evidently 'yath,' the original infinitive form containing the theme or notion of the action was evidently 'yathamathi,' the medial 'a' being introduced as a connective. This leads to the conclusion that '-mi' or '-mathi' is a verbal definitive which was probably once a verb meaning *to do* or *make*, like the '-ed' of the past tense in English regular verbs which is *did* phonetically decayed. Another very suggestive comparison may be made between a Diyeri verb and its analogues in Kamilroi and Kabi :—

Diyeri.	Kamilroi.	Kabi.
wima, *put*	wimi, *put down*	womngan } womngathi } *give*

Diyeri.	Kamilroi.	Kabi.
wimuna, *putting in*		wiyin, *given*
wimarau, *put in* (imperative)	wimulla, *put down* (imperative)	womorai, *give* (imperative)
yinkumulana, *giving each other.*	wiulunni, *to barter*	wiyulaiya, *to exchange.*

In Diyeri 'wima' has no reciprocal, I therefore shew the reciprocal of 'yinkuna' *giving*. The original infinitive of the verb to give is probably 'wiyimathi' or 'wiyingamathi,' 'wi' or 'wiyi' being the stem. But what is specially noticeable is the close agreement of the imperative forms. The Kabi imperative is generally the simplest and shortest form of the verb but it has also a form in '-morai' as here represented, which appears to be emphatic and the force of -morai as also of the terminations in the other dialects '-marau,' '-mulla' is evidently *do*. In my contribution on the Kabi in Mr. Curr's work this passage occurs, "The ending '-morai' appears in some imperatives given in the table of conjugations. As we also find an infinitive termination '-moraman,' it seems to me that '-mor' was the stem of a verb now obsolete which was almost equivalent to the verb *do*, and it now exists merely as an intensifying ending."* I was not then aware that 'ma' or 'mara' was a verb in Wiradhuri meaning *to do* or *make*, but is it not highly probable that parts of that verb have become the regular terminal marks in different parts of the verb in many dialects as for example '-ma,' '-mi,' '-mathi,' '-man,' indices of the infinitive, and '-morai,' '-marau,' etc., of the imperative, and further is it not also probable that these terminations are radically connected with the Malay 'men' prefixed to words to transform them into verbs?

The Kabi Language.

Authority, personal observation. A fuller but less systematic notice of this dialect was contributed by me to Mr. Curr's work "The Australian Race"† which would illustrate and support my remarks here. For two or three points the Rev. W. Ridley's account of Dippil is drawn upon.

Kabi is spoken chiefly in the basin of the Mary River, Queensland. The name is one of the negatives of the language. I have taken this dialect as a specimen of the elaborate dialects of the East Central division, not because it is the most highly developed and richly modified, but rather because it belongs to that class shewing the various distinctive features of its near relatives the Kamilroi and Wiradhuri, and especially because rather than enter upon other men's labours I prefer where possible to tabulate a dialect which has not been systematically treated by any one else.

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* Curr, The Australian Race, Vol. III., p. 189.

† Vol. III., pp. 179–195.

Phonic Elements—Vowels.

a ā ā

ę (as in *yet* English) e ē ǫ (as in English *ton*) o ō

i ī u ū

Diphthongs.

au ai iu oi ou ua ui

Consonants.

k g ng

t d th dh ty (almost like palatal ch) y r rr (muffled cerebral) l n ñ ndh

p b v w m

Kabi has no words beginning with 'l' or 'r' and its terminal letters are 'l,' 'm,' 'n,' 'r,' 'ng,' 'ndh,' and vowels. Initial vowels sometimes occur but very rarely. There are occasionally as initial letters of a syllable such combinations as 'pr,' 'br,' 'kr,' but even between these a semivowel generally steals in. 'S' occurs only in the dog-call 'isē,' 'h' only in one or two foreign words. Writing about Dippil, Dr. F. Müller says, "In the vocabulary of Rev. W. Ridley there are indeed words in which 'th' and 'dh' appear, but we believe the existence of these sounds in an Australian tongue doubtful and due to imperfect apprehension."* Dr. Müller's distrust is perfectly groundless. An English ear cannot be deceived in the sound of 'th,' it is a characteristic Australian sound, and in Kabi of which Dippil is the nearest neighbour and almost the parallel, 'th' is pronounced exactly as in English *father*. The sound of 'dh' would be best illustrated by the value which would result from the 'th' in English *that* being preceded by a distinct 'd.' The Kabi 'v' is the equivalent of 'b' in some other dialects. Reduplication of consonants is frequent, each member of the pair being distinctly enunciated.

The Noun.

Number is denoted not by inflection but by an adjective added. Gender is not marked by inflection excepting that there is a trace of -kan or -gan as a feminine termination in proper names and in the term 'nulangan' *a mother-in-law*;† perhaps derived from 'yiran' or 'yirkan' *a woman*. In all other instances such words as *man*, *woman*, *mother*, are required to indicate the sex. Case is expressed by abundant terminations. Probably the nouns are divisible into declensions distinguishable by the stem endings, but I am unable so to classify them. In nouns and pronouns the usual duplicate forms of the nominative occur, the one denoting the subject simply, the other the subject as active agent.

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* Grundriss der Sprachwissenschaft, Vol. II., p. 42.

† 'Nulang,' *son-in-law*, 'nulanggan,' *mother-in-law*.

Noun Declension.

I employ the word 'yeramin' *horse*, because it is virtually a Kabi word although applied to an imported animal, and because I am sure of important modifications to which it is subject. The terminations in this particular word about which I am uncertain but which I have set down from analogy are indicated by an asterisk the analogies being supported by verified examples.

Nom.	simple	yeramin, *a horse*	dhakkē, *a stone*
,,	agent	yeramin-dō	dhakke-rō
Gen.		yeramin-nō*	kung-u, *of the water*
Dat.	to	yeramin-nō*	dhakkan-nō, *to the rainbow*
	to go for	yeramin-gō	
Acc.		yeramin-na*	nguin-na, *the boy* (object)
Abl.	because of	yeramin-ī	
,,	interest in, aloug with, or upon	yeramin-karī* or gari	wabun-garī, *on the stump*
,,	instrument		dhakke-rō, *with a stone* kuthar-ō, *with a club*

Other examples illustrating case are—

At or in—nolla-nō, *in the waterhole*
ngurun-nī, *by day*
kira-mī, *at the fire*
nolla-nī, *in the waterhole*
kira-ba, *with or in the fire*
nirim-ba, *in the middle*

According to Rev. W. Ridley the particle 'di' may be prefixed to indicate *of* or *from*, thus 'dhan di Boppil' *a man of Boppil*.

Pronouns.

The pronoun is abundantly inflected and is of the common type in first and second persons singular and first and third plural. Gender receives no sound mark.

Singular.	*First Person.*	Plural.
Nom. simple	ngai	ngalī or ngalīn
,, agent	ngadhu or adhu	ngalīndō
Gen. of poss.	ngañunggai	ngalīnngūr or ngalīnnō
Dat.	ngaibola	ngalīngō
Acc. acted on	nganna	ngalīn

Second Person.

Nom. simple	ngin	ngulam
,, emphatic	ngindai, nginbilin	
,, agent	ngindū	
Gen.	ngiñonggai	ngulamō
Dat. motion to	nginbola, nginbango	ngulambola
Acc. acted upon	nginna	
also after *give*		ngupu, *you all*

M. F. and N. *Third Person.*

Nom. simple	ngunda	dhinabu
,, agent	ngundarō	dhinaburō
Gen.	ngundanō	dhinabunō
Dat.	ngundabola	dhinabubola, dhinabunga

Duals.

ngalīnngin, *lit.* We-thou, used for *Thou and I.*
ngolom, *another and I*
bula, *you two*

There is no relative pronoun. For demonstrative the third personal is used, and also the words 'karinga' *this one*, 'koradhu' *that one*. To give a reflexive significance 'mitdhi' self, follows the personal pronouns.

Interrogative Words.

Nom.	simple	ngangai, *who*
,,	agent	ngandō
Gen.		ngañunggai
Dat.		ngangaibola, *to which place, whither*
Dat. and Acc.		ngangaiminī, *whom* or *which*
Nom.	simple	miñanggai, *what*
,,	agent	ngandō, *what*

minanī, *why*
minalō, *why*
miñamà, miñamba, *how many*
miñamanō, *during*
minanggo, *how*
miñanggai, *what*

weño, *when* or *where*
weñamba, *whether or not*
weñobola, *when, at what time*
weñomini, *where ever*
wandhurathin, *why*

'-amba' is a termination denoting *uncertainty, possibility,* and is sometimes affixed to participles as well as to adverbs.

The Adjective.

The language wants the article. The adjective is usually undistinguishable by sound-sign from the noun, but a common adjectival termination is '-ngur' shortened sometimes to '-ngu.' Adjectives can be formed from most nouns by affixing this post-formative, the original meaning of which is not clear, but the affix corresponds with the sign of the Kamilroi genitive also found in Kabi. Another adjectival ending in Kabi is '-dhau,' by the addition of which certain nouns become adjectives. The adjective

is indeclinable. It is generally compared by the help of such adverbs as 'karva' *very*. Another mode of comparison is to single out an individual and say of it *this (is the) large* or *this (is the) good*, and so on according to the particular attribute.

With the exception of the interrogatives enumerated already, and a few adverbs of place terminating in '-ni' and '-na' the adverb has no phonic index. Those in '-ni' and '-na' may be regarded also as locative cases of nouns. When a connective is used which is rarely, 'nga' answers for *and*, and if I mistake not another mode of uniting ideas is to sustain considerably longer than usual the final letter of a word.

Numerals.

The numeral system is binary. To express a number higher than two the terms for one and two are combined as may be necessary. Kalim *one*, bulla *two*, bulla kalim *three*, bulla bulla or bulla kira bulla *four*. The enumeration may be conducted higher after the same manner, but generally numbers above four are expressed by 'gurwinda' or 'bonggan' *many*.

The Verb.

The verb has various forms as *Simple*, *Reciprocal*, *Causative*, *Intensive*. But in certain instances what might be regarded as a special form might equally be regarded as a distinct derivative word from the simple form. Although regular examples may be given there is a capricious irregularity about the moods and tenses. Infinitive, Indicative, Suppositional, and Imperative moods are distinguishable with well-marked terminations. The infinitive and indicative may however be said to overlap. Tense as indicated by termination is very wavering, the same forms serving on occasions for present, past, and future time. There is a clearly marked preterite which is also a perfect participle terminating in '-n' with 'a,' 'i,' or 'u,' as preceding vowel. The infinitive serves as imperfect participle, and there is also a verbal noun. The shortest and simplest form is the imperative. Often it is one open syllable, it rarely exceeds two but sometimes adds '-morai.' Its termination is always in vowel sounds. The general verbal notion is expressed by the infinitive index which is usually '-man,' '-mathī,' or '-thin.' Some verbs may have an infinitive in two of these endings, thus there is 'yanman' and 'yanmathi' *to go*, 'ñindaman' and 'ñindathin' *to enter*. The difference between the significance of '-man' and '-mathi' is slight if any, but as compared with '-thin' the two former indicate *state* or *inactivity*, the latter *action* or *motion*. Person is not distinguished by sound but has either to be inferred or the pronoun is expressed and precedes the verb. Conjugation is by means of prefixes, affixes, and what may be called infixes. The prefixes generally are of adverbial

force, the affixes impart the modal, temporal, and participial signification, and the infixes may be regarded as possessing *formal* power, expressing generally causative and intensive variations of the sense, only it should be observed that the index of the reciprocal *form* is terminal.

The following exemplify the use of prefixes—'biyaboman' *to come back* from 'biya' *back*, 'baman' *to come;* 'yikiyaman' *to answer*, from 'yiki' *the same, likewise*, 'yaman' *to speak;* 'wuruboman' *to come out*, 'wuru' *out*, 'baman' *to come;* 'yīvarī' *to put, to make*, is probably derived from 'barī' *to bring*, and is varied to 'mīvarī' *to put away*, 'wuruyīvarithinī' *to put out*. In 'bīwathin' *to play*, 'wathin' means *to laugh*, and 'bī-' is an intensifying preformative, in 'biyelī' *to cooey*, 'yeli' means *to shout*, 'bi-' has an intensifying or prolonging force. In 'bīdhalīnda' *to cause to drink* the initial syllable transforms the Simple into the Causative Form or rather helps to do so for '-lī' and '-da' are also concerned in the change 'dhathin' being the vocable meaning *to drink*.

The following are examples of affixes—'-man,' '-mathī,' '-thin,' regular signs of infinitive, also of imperfect, indicative, and participle. '-an,' '-un,' '-in,' signs of preterite, perfect participle, and passive sense. '-ra,' '-thin,' '-thinī,' futurity and possibility. '-na,' '-nga,' '-ga,' '-da,' '-ngai,' marks of imperative mood, '-aio,' 'aü,' distinguish the suppositional mood. '-na,' '-ba,' are gerundive and participial (imperfect) signs. '-ira,' has the sense of forcing or pressing. '-iu,' implies irregular movement as exemplified in 'kauwaliu' *to search*, 'maliu' *to change*, 'yandiriu' *to perambulate*. '-mathin,' '-bathin,' '-wathin,' transform other parts of speech into verbs and impart the significations respectively of (1) *purpose*, (2) *becoming*, (3) *holding* or *making*. '-yulaiyu,' is the index of the Reciprocal Form, *e.g.*, 'baiyi' *to strike*, 'baiyulaiyu' *to fight*, *i.e.*, to *strike one another*.

Infixes—Such terminations as '-man,' 'mathī,' etc., express the general verbal sense, having some such force as *do* or *make*. Without removing this general verbal sign one or more syllables may be interposed between it and the stem; this is the usual mode of indicating the Causative and Intensive Forms. The word 'karī' means *here* or *in;* 'karīthin' is *to enter*, with preterite 'karīn.' The termination '-thin' differs little from '-man' or '-mathi' in force; there is then a verb 'kari-na-man' and another 'karin-di-mi,' both meaning *to put in*, '-na' and 'di' are the Causative indices. The word 'buwandiman' means *to herd*, lit. *to cause to stop;* it is thus compounded, 'buwan' *to stand*, 'di' causative particle, '-man' verbal sign. The infix '-li' is introduced to imply *doing well, progress, advantage*. Examples, 'yangga' *to make*, 'yanggalīnoman' *to allow*, from 'yangga,' '-lī' *to advantage*, '-no' *permission*, '-man' verbal sign. 'Womba' means *to lift*, 'wombalīman' *to fall upon*,

'wombalīn' *carrying;* the word 'wombalīmaraiō' may therefore be thus analysed, 'womba' *to lift*, '-li' *motion*, '-mara' sign of futurity '-aia' mark indicating supposition.

One kind of modification yet remains to be noticed viz., reduplication. This is the usual sign of the Intensive Form, *e.g.*, 'yelīman' *to shout*, 'yelelīman' *to speak quickly*, 'dhoman' *to eat*, 'dhandhoman' *to gnaw*, 'dhomma' means *to catch*, 'dhomathin' *to hold, to grip*, 'dhommoman' *to marry, i.e., to catch* and *hold fast!*

Mr. Threlkeld in his Key to the Structure of the Aboriginal Language is overpowered and carried away by a mystic propensity when he affirms that to the aboriginal mind particular letters or syllables have a sense inherent in the sound. However, from examples which he gives as well as from the above, it is evident that a letter or syllable may be elegantly introduced to delicately shade the meaning of the verb. But such letters or particles are no doubt the remains of words too much broken down to stand alone.

Paradigms—Forms.

Simple.	Causative.	Intensive.	Reciprocal.
yelīman, *to call*		yelelīman, *to speak quickly*	yathulaiyu, *to converse*
yaman, *to speak*			
buwan, *to stand*	buwandīman		

Moods.

Inf. and Indic.	Imperative.	Suppositional or Subjunctive	Verbal Noun.
yelīman, *to speak*	yelī		yelīnba
baman, *to come*	ba		
buwan, *to stand*	bubai	boiō	

Preterite, Perfect Participle, and Passive 'ya'an' *spoken*, 'ban' *come.*

Auxiliary verbs are unknown; temporal differences are generally expressed by an adverb of time.

This may be the best place to show the relation which Kabi bears to the other dialects of the Central Eastern class, chiefly to Kamilroi and Wiradhuri. The very name Kabi is the local equivalent of Kamil, the Kabi people would drop the final 'l' as in the word 'mī' *eye* of which the Kamilroi form is 'mil.' From the sea coast at Maryborough for about 450 miles inland in a south-westerly direction the natives may be regarded as virtually one tribe lingually. The following are particular analogies :—

Kamilroi.	Kabi.
andi, *who*	ngandō, *who*
minya, *what*	minyanggai, *what*
gīr, *verily*	gīvīr, *verily*
yeäl, *merely*	yul, *in vain, gratuitously*
guru, *round*	kurī, *round*
baoa, *back*	biya, *back*

Kamilroi.	Kabi.
taon, *earth*	dha, *earth*
tulu, *tree*	dhu, *tree*
moron, *alive*	murrumurru, *full of life*
giwīr, *man*	kīvar, *man*

Many other examples might be adduced.

I shall conclude this sketch with a table of case endings; for those of the first four dialects I am indebted to Dr. F. Müller's Grundriss der Sprachwissenschaft, the fifth I add to shew the place of Kabi in the group.

Lake Macquarie.	Wiradhuri.	Kamilroi.	Turrubul.	Kabi.
Nom. Agent -to	-tu	-du	-du	-do
Dative -ko	-gu	-go	-ngu	-no and -go
Genitive -ko-ba	-gu-ba	-ngu	-nu-ba	-no and -ngu
Albative -tin	-di	-di	-ti	-ni
Locative -ta-ba		-da	-da	-ba

The verbal definitive elements differ considerably. A comparison of interrogative words lead to the same conclusion, viz., that all the members of this group are very closely related.

The Language of the Wimmera District in N.W. of Victoria.

Authorities :—Revs. F. A. Hagenauer, A. Hartmann and F. W. Spieseke, in contributions to Smyth's Aborigines of Victoria, Vol. II., pp. 39, 50, 55, 76. The accounts of the two latter contributors fairly agree. Mr. Hagenauer's shows considerable differences.

Phonic Elements—Vowels.

a ā ā
e ē ö o ō
i ī u ū
diphthongs ai au oi

Consonants.

k g ch ng
t d ty or tch dy y r rr l n ñ
p b v w m

As in the Central Eastern Division there is a marked preference for consonants at the beginning of words. Any consonant except 'r' may be initial. There is no restriction as to terminal letters. We find here initial 'l' and medial combinations as 'rt,' 'pkr,' 'rpk,' 'rmb,' which would not be tolerated in the Central Eastern dialects.

The Noun.

Difference of number or gender is not marked by sound. For the plural, above a certain small number a term signifying *many*

is added or the word is reduplicated. The noun is thus declined,

	Singular.	Singular.
Nom.	wūtye, *a man*	galk, *a stick*, wille, *opossum*
Gen.	wūtyūgitg	nom. agent willetch
Dat.	wūtyuk	
Acc.	wūtye	galka and galko
Abl.	wūtyūkal, *by a man*	
Exat.	wūtyenung, *from a man*	
Erg.	wūtyel, *with a man*	galko, willedyal, *in an opossum*

The Pronoun.

The Pronoun shows considerable modifications. It is subject to be attracted to other parts of speech in abbreviated form, *e.g.*, the possessive pronoun is affixed to the noun 'mam' *father*, thus—

mam-ek, *my father*	mam-endak, *our father*
mam-in, *thy father*	mam-angngodak, *your father*
mam-ūk, *his or her father*	mam-emmak, *their father*

Adjectives may become passive verbs by a similer process, thus 'katyelang' *sick*, makes 'katyelang-an' *I am sick*, 'katyelang-ar' *thou art sick*, and so on. The importance of the pronominal element affixed to the verb will be observed further on. I shall show two tables of the pronouns, the first by Mr. Spieseke, the second by Mr. Hagenauer, as I think that both are required for an explanation of the verb and for a fuller view of the language.

Personal Pronouns—First Person.

	Singular.	Plural.
Nom.	ngan	ngo
Gen.	ngek	ngendak
Acc.	ngerrin	ngandank
	Second.	
Nom.	ngar	ngat
Gen.	ngin	ngodak
Acc.	nganung	din
	Third.	
Nom.	ngait	ngaty or ngatch
Gen.	nguk	ngeannak
Acc.	ngun	ngin

Second Table—*First Person.*

	Singular.	Dual.	Plural.
Nom.	walūnek, ñanon	walūnganūk	walūngingorak, ngarra
Acc.	walūnūngek	walūngūngnok	wallogingorak
Abl	walūgalīk, *by me*	walūngnūngnalūk	wallogaringorak

Mr. Hagenauer also gives a dative singular 'gangek' *for me* and a genitive plural 'gorak' *ours*.

Second Person.

	Singular.	Dual.	Plural.
Nom.	walūngin	būlet wūl	
Acc.	walūngin	būlet wūl	
Abl.	walūgalet	būlet wūlek	
Voc.	walūngīn	būlet wūlan	

Third Person.

Nom. gilla, ñogung, ño būlang giang

It will be observed that in the first and second persons in the second table there is an introductory particle, 'walū,' this probably some word such as *self*, more exactly defining the pronoun, when this is decapitated the likeness of the two tables is rendered more close.

Interrogatives.

Nom. wiñar, wiñarū *who* wiña and gio *where*, wiñang *how far*
Gen. wiñarait wiñatuk *which*
Dat. wiñarangait
Acc. wiñer ngan *what*
ngak *why*, ngango *how*.

Adjective.

The article is not present. The adjective does not seem to be declined. Comparison is denoted by reduplication. The adjective commonly precedes the noun, a somewhat rare position for it to occupy.

Numerals.

The numeral system is binary. The method of enumeration is 'kaiup' *one*, 'būlet' *two*, 'būlet kaiup' or 'būlet ba kaiup' *three*, 'būlet būlet' or 'bulet ba būlet' *four*, and so on. The natives of this tribe counted up to twenty which is 'būletgedi manya' (apparently *twice-two hands* or *both feet and hands*).

The Verb.

The verb seems simpler than in most dialects, but the apparent simplicity may be due to want of full information. Conjugation is by post-positions. The pronoun abridged is attracted to form an affix, showing number and person, and a different fuller form (apparently an accusative case) of the pronoun distinguishes the passive from the active voice. The word 'mala' with the appearance of an auxiliary verb occurs along with the principal verb in perfect tenses and in the potential mood. Of the different writers one places it before the principal verb and joins on the pronominal affix to it, the others make it succeed the principal verb. Time seems hardly distinguished save by this word 'mala' with the force of *have* or *had*, and by a word such as 'maluk' signifying by-and-by and denoting the future. Certainly in Mr. Spieseke's

view of the verb the particle 'in' is introduced between the stem and the pronominal element to indicate past time, distinguishing the imperfect from the present; the same particle is affixed in Mr. Hartmann's view to mark the future. This double use raises distrust in its temporal power. There appear to be at least two participal forms, the imperfect ending in '-na,' the perfect in 'n' with a preceding vowel, as 'prinna' *(is) rising*, 'prinnon' *risen*.

The following is a table of the pronominal elements used as post-positions to distinguish number and person in the verb, the first consonant of the affix in the active voice may be 'g,' 'y,' 'ng,' or may be elided as ease of utterance may require. In the passive voice the pronominal element is free from accommodating phonic change, and by comparison with the declension of the personal pronouns it will be recognized as the accusative case. The third person singular of the verb in the present imperfect and future tenses is joined with the various accusatives to form the passive voice in these tenses, so that the present indicative passive would run *he sees me, he sees thee*, etc. This mode of forming the passive corresponds with that which prevailed at Lake Macquarie, N.S.W.

	Active Voice.		Passive Voice.		
	Sing.	Plural.	Singular.		Plural.
1	Pers. -yan	-yango	(ñaing *sees*) -naingn	(ñaing *sees*)	-niyangoring
2	,, -yar	-yat	,, -ñiurnung	,,	-niyurding
3	,, -n, ng, or -kinya	-gitch or -gatch	,, -ñitch	,,	-nityaning

For imperfect tense of passive, 'nyain' *he* or *they saw* is used throughout; and for the future, 'ñakin' *he will see* followed in both cases by the pronominal affixes as above.

Conclusion.

That this account of the aborigines does not profess to be exhaustive hardly needs to be stated. Some practices have been passed over without notice, such as various games, the chewing of the leaves of Pityeri *(Duboisia Hopwoodii)* sometimes mixed with the powdered twigs of an acacia plant and together having a stimulating or narcotic quality, and so forth. Nor does the writer regard his conclusions on certain important points as final, but rather as a step towards finality There are difficult questions which are well worth much closer attention than they have yet received, among which may be mentioned the nature of the relation which subsists between the Australians and the people of India. This is a knotty question which cannot be settled one way or another with a wave of the hand. The writer is firmly impressed with the conviction for which he trusts good grounds have been given, that there is a real genealogical connection between the Australians and the people of Central and Southern India,

although a better explanation of it than is offered here may yet be forthcoming. That the Tasmanian Papuans were the warp of the web of Australian society, and that people of Malay blood have been part of the woof he regards as thoroughly demonstrated but he is of opinion that after the Tasmanian and Malay elements have been eliminated there is a residuum which he has denominated the Indian element. This view does not exclude the presence of a trifling admixture of other racial elements such as Chinese, but too inconsiderable to be noticed here. The main instrument to disentangle the racial constituents will be the science of philology.

Much may yet be done by comparing different dialects, to shew the original form of definitive endings which have virtually lost their identity, and besides explaining their own peculiarities Australian dialects may throw light upon some Asiatic languages. The sketch of Australian languages here given has been necessarily brief, but sufficient it is hoped to show their general features and in some measure their mutual relationship. A more thorough and extended study of Australian language will amply repay the labour of the philologist inasmuch as it forms a very fertile field for his science. Many striking examples of metonymy are noticeable, such as the characterizing of men and kangaroos by the same name, a peculiarity remarked by Mr. E. M. Curr. It is common to find a tribe applying to the kangaroo the term which a neighbouring tribe applies to man, and even within the same tribe kangaroo and man are designated by the one name or by names almost identical Another remarkable feature is observable in the application of what is etymologically the same term to very different animals. Thus the word for *opossum* in one place may be the name for *dog* in another. It is much to be regretted that so little of the Tasmanian speech has been preserved, since it may be employed as a touch-stone for testing the Papuan element in Australian languages, not overlooking the fact that particular terms may be common to two distinct races.

Discussion.

Rev. S. Wilkinson—I should like to know whether there is any reference in the paper to the rites of burial of the aborigines. I have resided fifty years in Queensland, Victoria, and this colony, and I think the burial rites of all others are most deeply interesting, and give us a touch of nature beyond anything I have seen among them which makes the world kin.

Mr. C. Moore—My knowledge of the aborigines extends over a period of forty-two years. As in their natural state they live in a state of perfect nudity I take it that wherever in these drawings they are shewn in clothing they must have seen some

white person. I know as far north as Rockhampton forty years ago men and women were perfectly naked without any covering whatever. This is peculiar, because two years before that I went through the South Seas and visited the New Hebrides, the Solomon Group, and New Guinea, and we saw no naked women—all had some clothing; but the men were naked. But in this country they had no clothing whatever—they were perfectly naked. Therefore, wherever they are represented by a covering that proves they must have got the idea from some white person. There is another thing I may mention. I do not ever remember an aboriginal in this country building a house for himself. Where houses have been found on the northern coast the natives must have come in contact with white persons. But so far as I have been able to learn the true aboriginal has no permanent dwelling. Travellers have found no dwelling—merely a gunyah—because they were a nomadic race. As to their corroborees, I believe they were initiated into the lewd practices by white men; at all events that is the information I got in 1853. In the Fraser Islands there were some corroborees and some of a lewd character, and I was informed by some of the early settlers that the natives had learned these practices from white settlers.

Mr. J. F. Mann—In reference to these corroborees, at a certain season of the year a tribe sends an ambassador to another tribe to get information. He goes back with a new song or new dance, and if they can copy anything a white man does, he figures in the song or dance, and I can easily understand their lewdness arises from copying the white-fellow. I never found these blacks very bad in that way naturally. In some of their songs I have seen them imitate a drunken white-fellow going to the lock-up. Some years ago I made a series of sketches showing the habits and customs of the aborigines, and have brought a few with me. (Mr. Mann here exhibited several sketches.)

CORRIGENDA.

Page 368, 7th line from the bottom, 'gehn' should be 'gehen.'

„ 399, 37th line from top, phratriæ should be phratries.

C c—November 6, 1889.

AIDS TO SANITATION IN UNSEWERED DISTRICTS: POUDRETTE FACTORIES.

By J. ASHBURTON THOMPSON, M.D., D.P.H., Chief Medical Inspector, Health Depart., Government of N.S.W.

[*Read before the Royal Society of N.S.W., November 6, 1889.*]

SINCE preparing the following communication it has seemed to me that some few words of preface are desirable. When time is limited, writers who advocate reform of details speak necessarily of faults alone; and it frequently happens that their strictures upon particular matters are taken to imply a general condemnation. That is an error which it is sometimes well to guard against; and perhaps especially when hygienic methods form the subject, wherein all cities can show so much that it is easier to condemn than to applaud. Hercules is not known by his foot alone; and therefore, after pointing out that the following remarks have application to unsewered districts only, I will just formally mention the magnificent schemes of water-supply and sewerage which are either completed or in progress, as well as the liberal appropriations recently made for their extension. And if I take advantage of the opportunity to remark upon the wise energy of the present Minister for Public Works, I trust that I shall be acquitted of presumption. He has in quite a short time succeeded in getting Parliamentary sanction to the execution of some sewerage schemes which have been ready for several years, as well as to others more recently designed. Now, for several years past much vague discontent with the action of successive governments in regard to works of sanitation has made itself audible; but, the public have omitted to consider that governments are but phases of organisation, not creations—and that no people can get more out of its government than they have themselves first put into it. It is therefore matter for satisfaction that at the present time many things concur (as I think) to suggest that the people, who have recently looked with a resignation which can have had foundation only in false and even superstitious views, upon the prevalence of certain preventable diseases are now beginning to observe in that prevalence a manifestation of eternal law, truly, but under circumstances which they themselves foster—and to understand that while the law is indeed immutable, the conditions which give it scope are theirs to alter. For these reasons I scarcely hesitate to remark in this place upon that instance of foresight in the very quarter in which foresight can take practical effect, to which I

have already referred : with confidence I invite you to infer that Mr. Bruce Smith at all events has learned that first-lesson in economy —what is gotten must be kept ; sees in the waste of life that secretly accumulates "with the stealthy drip of blood" from day to day, year in, year out, a most potent obstacle to social efficiency, to numerical increase, and therefore to national prosperity ; and is determined for his part to do what he may to stop it.

The organic refuse of urban districts is all of it powerful to harm man ; but it may be divided into two classes which are distinguishable by a characteristic. The one class comprises those matters which are usually referred to under the terms "garbage" and "slop-water": these, in course of putrefaction, are common causes of ill-health, but perhaps rather of general derangement than of specific disease. The other class comprises the excretory products of the body ; and while these may, like the former, cause general illness when by way of air or water they are again taken back into the body even in small quantity, they are also liable to carry the infection of specific disease with them. Indeed, if they are considered in the mass—and that is the view which I now take of them, it may be said that they are constantly infected with the causes of defined disease, which propagate and increase in the favourable soil they offer, and which are communicated from them to man again. The lowest rates of sickness therefore cannot be secured in any district from which both these classes of organic waste are not completely and promptly removed before putrefaction has time to begin in them ; can be secured, that is to say, only where there is a complete system of sewerage, and a well administered organisation for the removal and destruction of the proportion of solid waste which sewers are not capable of carrying: but I think it follows from the characteristic difference I have pointed out, that the removal of excretal wastes is the more important work ; and that the district in which this was thoroughly done would be found to have a lower death-rate than another in which garbage and slop-water were thoroughly removed but this neglected. In addressing you, however, I need not elaborate that point. The circumstances under which several of the plagues prevail which chiefly vex the human race to day are, indeed, almost matters of common knowledge now. Where this branch of scavenging is most neglected cholera, typhoid fever, yellow fever, and the diarrhœal diseases, are most persistently present, most prevalent at favourable seasons, and most fatal : and the concurrent experience of widely separated cities has discovered that removal of excretal refuse from soil and subsoil is the great measure effectual to abate them.

If soils were clean, waters would be clean too. But as it is found impossible in practice to get the necessary degree of purity of soil, special

measures directed to secure purity of water are not only prudent but indispensable. On the other hand the aim is not to secure purity of water alone; purity of air is no less necessary. (Cf. F. O. Reports, No. 117, Misc. Ser. 1889, Germany, "Notes on the decrease of Mortality from Typhus (Abdominalis) in Munich, 1851-87).

For these reasons, the scavenging of excreta may be named the most important duty with which municipal authorities are charged in unsewered districts. Perhaps of all who hear me speak—but the remark would have application in any other city and in any other Province; New South Wales is not eminent in morbidity—there may be scarcely one who, either in himself or in his family, has not suffered in consequence of their failure to discharge this duty. There is no need however to rely upon the narrow and doubtful basis of personal experience. The mortality returns show that for many years past about one-ninth of the urban deaths have been due to diseases whose prevalence is unmistakable evidence of failure in the particular direction referred to; and we, here present do not suppose, or surmise, or even suspect—but we know that so much of the mortality is no part of the inevitable death-toll, is not by way of nature, pays no debt.

Now, at the present moment it is the case that local authorities spend a large proportion of their revenue upon this branch of scavenging, and yet do not succeed in securing completeness. The reason is complex, no doubt; but, in tolerably well-managed districts, it may be taken to consist, mainly in the excessive haulage the present plan involves. The refuse, which is a very offensive and poisonous stuff, semi-liquid and unmanageable, is collected in tanks by a tedious journey from house to house; and then it has to be disposed of in some place which is distant from dwellings, and which is therefore outside the district scavenged as a rule. In consequence, wherever within a municipality a cart may have got its load, it must first reach some one point upon the boundary, and then from that point begin a long journey to the place of ultimate disposal. You see what waste of labour, of horse-flesh, and of apparatus, is thus caused; and that the expense mentioned above, disproportionate to results, is due to it. You also see, therefore, that in places where there are no sewers the only way in which economy in this work can be effected is by adopting some process whereby the liquid, foetid, and dangerous mass, may be converted into less than half its weight of dry, inodorous, and harmless powder, at some point either nearly central to the district scavenged or at all events central to a group of districts combined for this particular purpose. Machines of the class of which I am about to describe two examples, and they alone, can diminish present labour and cost, and so can set free funds, now almost wasted, for expenditure upon greatly improved methods—they alone therefore can contribute towards reduction of the death-rate

under the circumstances described. It will now be seen that I do not mention these machines because they offer some measure of private comfort or of merely municipal economy. Still less do I seek to draw attention to them on the score of novelty ; for in one or other part of the world their like have been long in use. Indeed, during a few years past repeated attempts have been made to persuade local authorities to adopt something of the kind, although without much effect. The only result has been to so far educate the public mind that when last year details of construction and cost were brought to notice by the presence here of a manufacturer of one kind of such machinery the Local Authority of Parramatta ordered apparatus. Until then the slight difficulty of getting such details in some other way was not overcome ; and even now Parramatta has not yet received its apparatus. Under these circumstances it seems well that it should be known that native ability has been busy in the matter ; and that now two kinds of apparatus have been actually at work for some months in neighbourhoods which are easily accessible to all whose business it is to be interested in them.

Those are among the reasons which have led me to bring to your notice a matter which, it is true, does not at first sight seem especially suited to the Transactions of this Society. If we recognize the loss of life alluded to and know its causes ; if we observe amongst its results not merely a diminished rate of gross increase of population, but also a diminished efficiency in the general body of society, an important proportion of whose members are more or less ill all the year round ; and if we are able to see that a great part of that loss is sheer waste, or in other words clearly preventable, it seems to me that nothing should be left undone to draw attention to practical methods useful to arrest it.

The apparatus to be described are erected at North Botany and at Newcastle respectively. They differ from each other in point of construction very markedly, as the diagrams before you show ; but it is not my object to compare them either as regards first cost or efficiency, and therefore after describing each I propose to show very briefly why their adoption must lead to reduction of death and sickness-rates in unsewered districts.

The apparatus of the New South Wales Ammonia and Poudrette Manufacturing Company (See Fig. 1) may be taken first, as being somewhat the elder of the two. It consists essentially of a steam-jacketted steel retort fitted with a central shaft bearing arms or stirrers, which is kept in motion by steam-power ; an air-pump by which a partial vacuum is maintained within the retort ; and suitable flues through which offensive vapours are drawn off and passed to the boiler-fires where they are consumed. The factory stands on a plot of ground which measures about three-quarters

of an acre, and which has frontages to Ricketty and to John Streets, in the newly erected municipality of North Botany. The machinery is contained in a substantial brick building which is so arranged that the crude material is received at a high point whence it gravitates, to the retorts placed below. It is approached from the front by an inclined road which terminates in a platform 22 feet above the ground-level, and large enough to turn a cart upon. At this point is a brick hood or chamber, which may be called the receiving chamber, and which measures 13′ 6″ × 11′ × 7′; it is closed in front by sliding-doors (Fig. 1A); and it is furnished near the wall-plate with a 12-inch flue through which the air is drawn off by a fan and propelled to the boiler-fires. In place of floor this chamber has a grating made of wrought-iron bars which measure three inches by three-fourths of an inch, which are set on edge three inches apart from centre to centre (Fig. 1B). Beneath the receiving-chamber is the distributing-tank. This is 20 feet deep; in shape it is rectangular, and for the first 14 feet from the top its sides are perpendicular; thereafter the foremost side trends backward to meet the after side which continues perpendicular to the bottom. It has a perforated iron plate (Fig. 1 C) within it which runs diagonally through it from a point beneath the grating which is close to the sliding-doors of entrance to a point in the forward wall which is a few feet above the bottom of the cavity. Thus the upper part of the tank is divided into two wedge-shaped portions which stand apex to base, the base of the forward division being uppermost and entirely covered by the grating. At the bottom of the foremost division are as many slide-valves actuated by levers accessible from above the grating as there are retorts to be fed; and at the bottom of the after division is a valve through which the fluid strained by the perforated plate from the more solid parts is admitted to the ammonia-still.

The use of this general arrangement is as follows:—A loaded cart ascends the inclined road, and backs against the sill of the receiving chamber; it discharges its contents upon the grating, and in falling through solid extraneous matters, such as brick-bats glass bottles, cans, &c., are separated from the rest; the remainder of the load impinges on the perforated plate and slides upon it to the valves, parting in its course with its liquid parts which reach the bottom of the after part of the tank (Fig. 1D). Passing now to the other side of the building and entering at the ground-level the retorts (Fig. 1 G) are seen to be so placed that at the crown they stand about five feet below the slide-valves leading from the distributing-tank; they are connected with the latter by nine-inch pipes, (Fig. 1 F) each of which has for control its own slide-valve accessible at this level. There are two retorts, constructed of $\frac{5}{8}$ths steel boiler-plate, 24 feet long, 3′ 8″ internal diameter,

and furnished with a steam-jacket (Fig. 1 E) which can be worked at a pressure of 100lbs. to the square inch. The retort carries in its long diameter a square shaft (H) which bears arms (J. J.) arranged at an angle so as to act as propellers, which is kept in motion by reversible gearing (K). It has also a tube connected with an air-pump by means of which a partial vacuum of about half an atmosphere is maintained ; and at one end a small door, through which the charge is withdrawn (L). In operation, the soil having been partially strained as described, is admitted to the retort in the quantity of three and a half tons at a time which forms a charge ; the steam-jacket is supplied with steam at a pressure of 80lbs. ; the stirrer is set in motion, and all vapours are drawn off and passed to the boiler fires where they are consumed, the inodorous gases produced reaching the outer air by the smoke-stack at a height of 70 feet above the ground. The temperature of the steam in the jacket at the pressure mentioned is about 324 F., and it is believed that the charge is kept at a temperature of about 300 F. After a term which varies with the quantity of water in the charge, but which may be set at six hours at the shortest or eight at the longest, the motion of the stirrers is made towards the extraction doors ; and the latter being opened the poudrette, nearly dry and quite inodorous, falls in powder to the floor beneath. It is then passed through a sieve to remove rags and the smaller fragments of glass &c., which may have escaped the grating, after which it is ready for bagging. I am informed that the capacity of these works, which have two retorts as described, is between 21 and 28 tons a day of 24 hours. I have mentioned an attachment to this apparatus—the ammonia still ; for this there would probably be no need under a properly conducted pail-system, and as it is similar in construction to the apparatus commonly employed at gas-works, I need not describe it here. Other apparatus employed are one 35-horse-power boiler for each retort ; a 10-horse-power engine supplied from one of these boilers, to move the revolving shaft, the vacuum pump, and the several fans ; steam-pumps for drawing water from a well, and other fittings.

I proceed to describe the apparatus used by the Eureka Patent Sanitary Burning Works (See Fig. 2) ; pointing out first, however, that it does not burn the refuse completely. This consists essentially of a fire-place and a reverberatory oven, with an arrangement for condensing and deodorising the vapours driven off. The oven is a rectangular, oblong, structure of fire-brick, which measures 22 feet by 5. The fire-place occupies part of the interior, running transversely across it against one short side ; the rest of the bottom forms the hearth, and has a slight fall from the fire-place towards the other end. The fire-bars have an area

of about 10 square feet; and either wood or coal may be burnt. In the roof of the cell and over the hearth near the fire-place is an opening through which the charge is introduced; and immediately under it is a grid of fire-bars set half-an-inch apart, by which the charge is divided into two parts—the more liquid matter passing through the bars, the more solid remaining upon them and so being exposed to the heat on both sides. Two other openings in the short side farthest from the fire-place give access to the interior at different levels; through the upper opening a rake can be passed over the grid; and through the lower the charge is extracted. In the roof just above these is a fourth opening which gives access to the smoke flue. The treatment of vapours is as follows:— The smoke-flue enters a smoke-box constructed of 14 inch fire-brick work which measures 15 × 7 × 7 feet. Close to and a little above the entrance of the flue near the top of the smoke-box is a water-spray which is scattered throughout the chamber by a steam-jet. The water falls to the bottom of the chamber carrying with it some of the organic matter in the vapours, and passes through a bed of vegetable charcoal three or four inches thick to a waste-pipe by which it is conducted to a well close by. The rest of the vapours leave the chamber on their way to the smoke-stack by a flue which is constructed of 18 inch glazed-piping. This flue pursues a serpentine course beneath the ground, 185 feet in length; and it is laid with a slight fall towards the smoke-stack. It is kept supplied with a stream of water about 6 inches deep, by which the vapours are still farther cooled and purified. It enters a dust-chamber at the foot of the smoke-stack; the water falls on to a bed of charcoal, and, passing through it is carried back again to the well mentioned in connection with the smoke-box, and thence is in part pumped up and used over again. The fumes ascend, being for the third and last time washed by a spray which descends through the dust-chamber; after passing through this they ascend the stack and reach the outer air at its summit, 75 feet above the ground. On examining the vapours within the dust-chamber it is found that they are cool, and almost entirely devoid of other smell than is due to the coal used in the fire-place. Other apparatus employed is a small steam-engine to move a mortar-mill in which the partly-charred poudrette and spent charcoal from the filters is ground up together, and to supply steam and water for the showers and smoke-flue as mentioned above. These ovens or cells are erected in pairs, thus forming a battery; and at Newcastle a single pair of cells is at present in use. As to capacity, the inventor's statement is that each cell can sufficiently dry a ton of soil in an hour; and from what I have seen I believe the battery able to deal with the refuse at a rate not very far removed from that. The partly fused glass-bottle which is before

you may be taken to illustrate the temperature attained in these ovens.

I took an opportunity of testing the capacity of this apparatus, but, owing to circumstances which it is unnecessary to relate in full, the trial was not a fair one. The fires were drawn and the oven thoroughly cooled; and then at 6 o'clock a.m. the furnaces were lighted again. Five hours later one ton of crude material was put into each cell, and in 75 minutes was dry enough to be withdrawn; and it was subsequently ascertained by Mr. W. M. Hamlet, the Government Analyst, that the charge contained 67 per cent. of water, and the poudrette 17 per cent. The battery is sunk in wet sand; and the consequence of letting the fires out was seen in soaking of the lower part of the apparatus and the surrounding walls to a height about level with the floor of the oven; this moisture is scarcely perceptible when the oven is kept in full blast. On the other hand the quantity of the charge may seem small; but in practice I understand that the refuse is introduced in something like that quantity; and the inventor's statement as to efficiency is that it will reduce a ton containing from 70 to 80 per cent. of water to poudrette in about an hour. Perhaps each cell may be regarded as capable of reducing 15 tons in twenty-four hours of continuous work, or the battery 30 tons. It should be noted however that on withdrawal from the oven the charge is still obviously moist; but that after an exposure to the air of a few minutes it dries, to the degree shown by the estimation mentioned, by retained heat. Its value as manure is small.

Such being the detail and approximate efficiency of these two machines it remains to speak of their practicability as regards the production of nuisance. Almost a vital point is the possibility of erecting them, if not at a comparatively central point of a single district, at all events at a point which is central to a group of districts; and if they cause the slightest nuisance their advantages would be discounted or even nullified by the necessity for erecting them at a spot remote from dwellings. Well, then, on this matter of production of nuisance there is very little to say for the best of all reasons; not only is no odour whatever perceptible outside their walls, but even within them is no nuisance, and scarcely any smell. A visitor may inspect the whole plant and watch the whole process at both places, and yet be unable to say what kind of manufacture he has witnessed, or what was the origin of the dry inodorous powder into which he has freely plunged his hands while examining it. I do not think I can describe the perfect inoffensiveness of these factories more clearly than in the words just used, essential as that character is to their successful employment.

From describing particular forms of apparatus I proceed to examine the incidental and essential advantages which may be expected to follow on the employment of such apparatus in general; and to show in some detail why they may be relied upon to reduce death-rates in an important degree. And first I mention incidentals. Out of the saving in cost of haulage which would be made, existing arrangements might be so improved that at present rates

residents would get more than they have ever had before in the way of cleanliness, comfort, safety, and regularity. But, although so much might be done with assistance of a poudrette apparatus by the Local Authority itself, I have by observation and reflection, been brought to think that the public would be better served if the Authority let this part of town-scavenage to responsible manufacturers ; and I am certain that they would be glad to get rid of a business which is a source of embarrassment and of anxicty to them, if the change involved no increased charge upon the rates. The public would be better served because a company would neglect nothing to ensure success, and because if the contract were carefully drawn the latter would be under the most perfect and most easily exercised control in case of complaint. For to defend themselves they must conduct the whole business from beginning to end with their own staff, so as to avoid the risk of failure involved in divided responsibility ; they must arrange that the work shall be done during some hours of daylight, because they know very well that effective supervision during darkness is practically impossible, and because they know also that householders will never feel safe, nor property be really secure, as long as private premises are liable to invasion during the small hours by persons who are heard but not seen, and who may or may not be there on a lawful errand. Lastly, to render day-work possible they must provide the best apparatus, and keep it in perfect repair.

Thus, to let the contract would ensure many incidental advantages which fall under the headings 'economy' and 'comfort.' I proceed to vastly more important considerations, and to enquire in what ways the suggested arrangement would essentially better the sanitary state of unsewered districts.

1. In the first place you will have observed that the business of the poudrette maker consists in evaporating water ; and therefore the drier the refuse he receives the less work he has to do, and the less are his expenses. A more important consequence flows from this circumstance than is at first sight apparent. It is nothing less than the abolition of cess-pits. In wet weather those receptacles, in whatever way they may be constructed, are little better than wells, and their contents but little more than dirty water ; and therefore one of the first articles of a manufacturer's contract stipulates for their removal, and that pails shall be substituted for them. It would take too long to show on this occasion the full importance of this exchange, and why it might be properly called momentous ; but I may remind you that in a document touching the prevention of typhoid fever which was lately presented to Parliament, I named removal of those fatal pits indispensable to any serious attempt to abate the prevalence of that

disease. Perhaps by this side-wind of private enterprise we may presently be wafted to more salutary waters.

2. Secondly, the disposal of refuse on their own (or other people's) property by householders, would be arrested. I have thus far said nothing of the manurial value of poudrette; and, without going into detail, I now mention that it has some market worth. The maker wants all the crude material he can get, therefore; and he will take care that all is secured to him by his terms of contract.
3. Now, if any householder should observe that it is just because the crude matter has manurial value that he desires to use it on his own land, I point out in reply the third sanitary advantage offered by these companies. That householder would use the refuse in its natural state, putrescent, and from time to time able to communicate disease. But the process of conversion into poudrette renders it entirely harmless. It is no longer putrescent, nor even putrescible as long as it is kept dry; and it is incapable under any circumstances of spreading specific forms of disease.
4. And farther touching this same point of thorough scavenage: you know that under existing arrangements ultimate disposal is the great difficulty. Smooth reports to the contrary notwithstanding, it is so great as to lead frequently to that neglect to scavenge which in the poorer neighbourhoods is so distressing and so dangerous. But a poudrette factory is an inexhaustible receptacle; it therefore removes the temptation to shirk collection which, not infrequently, operates to-day.
5. Indirect as is the manner in which the foregoing advantages accrue, they are none the less valuable. But in handing over this work local authorities would have opportunity of making many direct stipulations. They would require that receptacles be thoroughly cleansed before being replaced; that escape of effluvium from them should be prevented before removing them; and, perhaps, that they should be disinfected.

I take advantage of this opportunity to explain something recently said as to cleansing, which I observe has been misunderstood in several quarters and confused with disinfection. A receptacle which is carefully handled at least once a week can be thoroughly and expeditiously scoured by inverting it over a perforated steam-pipe delivering steam at about 30lbs pressure; in skilful hands the metal may in this way be rendered as clean (though not as bright) as when it left the maker. But disinfection is another matter. This is a strictly scientific proceeding; that is to say there is no such thing as partial or approximate disinfection—it must be done under fixed conditions, and it must be done completely. For the present practical purpose it seems to me that there can be no choice of agents; moist heat must be used, and under certain conditions both of temperature and time. The requirement is that every part of each vessel shall be brought to a temperature of 212 F. and kept at that during five clear minutes. This might be done in one of two ways.

Either a current of steam might be introduced into a closed chamber which, since no pressure is necessary, might be of quite simple construction; or else the receptacles after cleansing might be plunged into a tank of boiling water. The latter seems the more certain, simpler, and more expeditious plan; but choice could be made only after trial on the practical scale.

Those seem to be the more important ways in which adoption of the machines described would lead to that cleansing of soil and subsoil which I have already mentioned as indispensable to a reduced mortality from several prevalent diseases. I need scarcely repeat here what I have said on so many different occasions elsewhere—namely, that they should be regarded as indispensable in populous districts which are as yet unsewered.

Discussion.

Mr. C. Moore—In the process of drying is the charge subjected to such a heat as would cause the stuff to be roasted?

Dr. Thompson—It is subjected in that apparatus to a heat which is known, namely—something more than 300 degrees Fahr.

Mr. Moore—Because there can be no question about that the roasting process destroys the value of it as manure. The City Council have adopted the plan of burning the refuse, and it leaves little behind it except charcoal. I have tried it in many places and find it to be of very little value; but where the refuse is allowed to accumulate and to decompose in bulk then it becomes a most valuable manure, and when it is decomposed there is really no smell from it. But the smell when it is removed is simply abominable. I had a large quantity of the refuse carried to the Centennial Park—I suppose something like 1000 tons of it—and there was no complaint whatever until it was moved, but the moment it was moved the smell was frightful, so much so, that the residents in the district petitioned against using it, and I was obliged to stop for the time being, and when the winter came I used the remainder. It was perfectly astonishing the effect of that material placed over the sand. Where I stopped the line of demarcation was distinctly marked. Where I did not put that stuff the grass was very thin, but where I put it there was a fine layer of grass. With regard to Poudrette—I had some of this Poudrette (I do not know whose it was) to try the experiment with, and I set apart a small portion of ground and divided it into two. One portion had no poudrette on it, and the other had poudrette put on in some quantity, and I am sorry to say that there was no advantage at all from the portion which had poudrette put upon it. The experiment was simply unsuccessful. I have not been asked to give a certificate, but if I should be asked I shall have to say that it is of no use. I am satisfied that in the drying process there is some principle by which the fertilising

properties are in some degree destroyed, why I cannot tell, but no doubt all vegetable matter is destroyed in this dry process. Bones and fatty matter might not be, but the vegetable matter is. Now comes another curious fact which I have had very many years experience of. I had it in Wentworth Park, Victoria Park, the Zoological Gardens. and in other places. The town stuff was carted into Wentworth Park—there were thousands of loads of it—and men, women, and children were wallowing in this filth—absolutely wallowing in it for months and months. I made a particular point to enquire if any ill effects resulted, and was not aware of a single instance in which any one of these men, women, and children were affected by the smell. I asked the man in charge of it, if he knew any instance of any disease arising from it, and he told me that he did not know of a single instance. This was from town refuse. I suppose there is something in this—that where a smell dissipates freely there is no danger. There is not the fear to be apprehended from the smell arising from town stuff that many people suppose. I am sure that for nearly two years they sent town stuff into Wentworth Park. The middle flat of the Garden Palace Ground too, is almost wholly composed of town refuse, and if you dig down in places of it you would find pots, pans, and all kinds of things. the middle flat was dug down to the very rock to make a floor for the machinery department, and when the fire took place there was nothing left but the floor. I made carts go for this refuse, and actually got a good many loads of foundation stuff to put over it. Earth is perhaps the best deodorant : however strong the smell may have been, the smell ceases after putting the earth upon it. That is actually what the middle flat of Garden Palace is composed of now. With regard to this manure it is an excellent way of getting rid of town stuff, but I think it would be well to consider whether the destruction by heat cannot in some way be avoided. I cannot make any suggestion, I merely give my practical experience.

Mr. T. B. Trebeck—It seems to me that these deodorisers have sole reference to night-soil. The remarks of the last speaker were with reference to what came out of dirt-boxes : the kitchen refuse and house refuse.

Mr. W. A. Dixon—I have some practical acquaintance with this system. Now with reference to the abolition of cess-pits the lecturer spoke with regard to the value of the material—looking at it from a manurial point of view—the value of the material and the cost of manufacture being greater than it should be. But the worst point with regard to cess-pits is the extraneous matter that is put in ; there are bottles, dead fowls, rags, sticks, banister-rails, all kinds of rubbish of every description is put there down to kerosene tins. The great trouble in the manufacture of

poudrette is to get rid of this extraneous matter. The process is devised for treating one particular thing, night-soil; and not for treating bricks, jam-tins, and all that kind of thing. And the result is a great deal of trouble and the making of an inferior quality of the manufactured article. With regard to the manurial value it is great, and is contained in the ingredients the same as in human food. But with regard to using night-soil or any such material all experts in Great Britain and elsewhere speak about making manure; they do not regard the cleanings out of the house and stables as manure. They have to be *made* into manure. There are two processes, the natural process of the dung-heap or subjecting it to the same process. The original material is only the raw material for making manure. The treatment of night-soil process gives rise to such disgusting conditions that it is simply impossible to carry it on in a district unless it is removed from habitations, and therefore the only practical process is the subjecting it to such heat as will cause the destruction of germs and the elimination of noxious odours. By the poudrette system we have generally been able to carry the treatment on without any disagreeable odour and without anybody knowing anything about it. The only case in which a nuisance was occasioned was some months ago, and on that occasion the smell was certainly awful. It was in consequence of some man who had purchased half a ton of rotten cheese and put it in the cess-pit and left it there for a fortnight, and finding it was too much to stand about his premises got the night cart to take it away. The result was disastrous for the time being, so far as odour was concerned. This process must be looked upon as making manure, and it is necessary for making manure properly that materials should be got from pans and not cess-pits, which are abominations. They contaminate the soil. The only way to properly get rid of this nuisance is to use the pan system, as they can be moved and cleaned out properly.

Mr. F. B. Kyngdon—With regard to the remarks of Mr. Moore as to his practical experience of poudrette, I think some special circumstances must have operated to cause the failure of his experiment. Its manurial value is likely to be injured by evaporation of the ammonia. If Mr. Moore has found by practical experience plants will not grow—

Mr. Moore—They will grow. I could not see any difference.

Mr. F. B. Kyngdon—Where Mr. Moore sees no advantage in poudrette it is possibly due to an excess of the sulphate of iron; perhaps an unusual amount, more than necessary, would render its effect upon vegetation neutral. That might be the reason why the poudrette referred to by Mr. Moore had no manurial value.

Mr. Dixon—With regard to this question of poudrette the common quantity to be used is 4 cwt. to the acre; that is the quantity

suggested to be used. As to the great quantity of suulphate of iron the night-men will not use more than they can help; they make it last six months if they can. The quantity used is very small; so much so, that in applying 4 cwt. to the acre the quantity of sulphate of iron would not be more than 5 or 6 lbs. The quantity satisfactory is 7 lbs per ton of the original material. It has been found that in all grain crops the application of sulphate of iron is very advantageous, and the smaller quantity should certainly not have any deleterious effect. When first this poudrette manufacture was started their trouble was in getting a great deal of sand. The sand got in there, and the result was the poudrette manufactured was poor quality, but lately the materials supplied to the work have been of superior quality, and so better poudrette has been made.

Mr. T. B. Trebeck—I can concur with Mr. Dixon's remark about sulphate of iron. I have several times lately read that it is very valuable manure.

Mr. Henry Deane—In reference to the conclusions come to by Mr. Moore, it would I think be very desirable to know what process the poudrette he experimented upon had undergone. Whether it had actually undergone the process of roasting, or whether it had been produced under the temperature mentioned by Dr. Thompson, 300 degrees Fahrenheit.

Mr. Moore—I cannot say what process it underwent before it came. It was brought to me. I was asked to subject it to a trial and I asked my overseer to watch it, and it is quite possible that although it had no effect on the barley it might have had some effect on other vegetables, and perhaps growing plants—radishes, it might have had an effect upon different plants. But when my attention was called to the ground not more than a week ago I could not see any perceptible difference.

The President—There is one matter stated in the discussion I should like to draw attention to. I think Mr. Moore said that there were no bad effects felt in any way from a large quantity of putrescent or more or less decaying matter deposited in Wentworth Park and that men, women and children were wallowing in it and suffered no harm. That may be, and no doubt is perfectly true in this particular case. Still it is not a desirable state of things. There was no harm done in this particular instance, because I suppose disease germs happened to be absent or in an inactive condition. In Sydney some years ago the water was very much contaminated by the contents of the soil pans, and it so happened I had to examine into this matter, and one of the arguments brought forward against my report was it could not have been so bad otherwise there would have been some sickness, but my reply was that the fœcal matter happened to be healthy. If it had been

unhealthy the results might have been very disastrous. The same too with this garbage that Mr. Moore speaks of. I do not think we should be thrown off our guard by experience of that kind, because it so happens that no harm was experienced then. With regard to the ferrous-sulphate, I do not think that a small quantity of it is injurious, but does the ferrous-sulphate pass out in the form of ferrous-sulphate! Does it not pass out in the form of ferric-oxide? We all know ferruginous soils are not particularly fertile. It may be that the want of benefit Mr. Moore noticed in this particular poudrette was due to the large quantity of sulphate of iron. It may be that there was too much, and that the plants were over stimulated. After all, these are only surmises. No doubt if these poudrettes are properly prepared they are good for the land, and a good means of getting rid of a troublesome substance. I have much pleasure in conveying to Dr. Thompson the thanks of the Society for his very valuable and interesting paper.

Mr. Moore—If any gentleman here has the slightest interest in this poudrette, I will most willingly place a portion of ground at his disposal in a very reserved part of the Gardens, in order that he may test it in any way he likes, and he shall not be interferred with. He can try it under his own superintendence.

Dr. Thompson—The discussion has tended to become a discussion upon manures. Mr. Moore's remarks upon that subject are no doubt of very great interest, but I have spoken solely from the sanitarian's point of view; and in replying to him I shall confine myself to those points wherein he mentions disease, for manurial value is not within my knowledge. He said that men, women, and children, wallowed in garbage, and yet did not fall ill. Perhaps not; but I can tell Mr. Moore this—that when the immense deposits of garbage at Wentworth Park was cut into by the Sewerage Department in 1886, there was great difficulty in getting the work carried on, because the men were repeatedly made ill; they would work for two or three hours and would then be siezed with illness so severe that their lives appeared endangered. Even the other day did not some ingenious persons endeavour to get permission to bore for natural gas in Wentworth Park? There was an escape of gas there which I saw ignited; but it was the gas of decomposition arising from the monstrous deposits of garbage that have been made there. That poisonous gas penetrates every house that is built on garbage—at Wentworth Park or elsewhere, and kills the wretched inhabitants. But I can tell you something more, of which perhaps you are not aware. What were those children wallowing in the garbage for? In the case of that stinking accumulation which was made this year at the entrance to the Centennial Park, which has an approximate depth of 14 feet and an approximate superficial area of 1,600 square

yards, I know as the result of enquiry what they were there for: they were there to gather rags, and those rags were subsequently torn up into flock without undergoing any previous purification. And that flock was sold to furniture makers to stuff couches and chairs—and not inferior furniture alone, but the very best kinds as well as the worse. I know all this from enquiry among the trade. Possibly this stuff may be comparatively harmless when spread in a thin layer over public recreation ground; but however that may be I have always consistently advocated its destruction in furnaces, because I know that wherever it is not so destroyed it is always used to make foundations good, and to make the building of inhabited houses easier on irregular sites. There are plenty of places where this has been done in Sydney.

Mr. Moore—With regard to the illness of those who worked in the sewers there the smell was concentrated, and I believe it is admitted by medical men that a concentrated smell is dangerous.

Dr. Thompson—Concentrated arsenic will kill you in three hours, and dilute arsenic from the wall-paper will kill you not less surely, though it may take three months to do so.

WELL AND RIVER WATERS OF NEW SOUTH WALES.

By W. A. Dixon, F.I.C., F.C.S., Lecturer on Chemistry,
Sydney Technical College.

[*Read before the Royal Society of N.S.W., December 4, 1889.*]

Some years since I contributed to the Proceedings of this Society a paper on the "Deep well-waters of Sydney," and since then I have made a number of analyses of waters from various parts of the country. Separate analyses of waters generally are not of value for any scientific purpose, but when numerous analyses are collected they do become of value, and this paper must be taken only as a slight contribution towards a knowledge of our underground and river waters.

The subject of the composition of waters seems likely to become of great importance before long, owing to the efforts being put forth to carry on irrigation on a large scale. It is evident that to apply water containing any considerable quantities of salts in solution to soils already containing large quantities of them will,

unless there is efficient drainage, cause a gradual increase of salts until the soil becomes unfit for the growth of useful plants. So far as I know, there has been no systematic chemical examination of the various waters obtained by boring in this country and it seems a pity that this has not been done, as it is possible that in some of our arid country the use of such water, either directly for irrigation or indirectly and much more slowly though its use for watering stock may for the time be advantageous, whilst the ultimate effect may be quite the reverse.

I have arranged the analyses beginning with the purest, which in my experience are those obtained from shallow wells and springs in the Hawkesbury sandstones, that is when they are uncontaminated by the encroachment of population. The first three analyses are from springs in the Blue Mountains.

Water from springs at Blackheath :—

	No. 1.	No. 2.
Chloride of Sodium ...	0·68 grs. per gln.	0·79 grs. per gln.
Chloride of Calcium ...	0·22 „	0·30 „
Chloride of Magnesium ...		
	0·90 „	1·09
Inorganic ammonia per million	0·08 „	0·09 „
Organic Ammonia „	0·08 „	0·03 „

Very minute traces of sulphates and nitrates were present, but the quantity of each was exceedingly minute.

Spring at Katoomba.

This sample was taken after the long continued dry weather of 1888 and early part of 1889, and just after the heavy rains of May last :—

Oxide of Iron	0·7 grs. per gln.
Carbonate of Calcium ...	4·6 „
Carbonate of Magnesium ...	0·5 „
Chloride of Sodium ...	2·8 „
	8·6

Inorganic ammonia, traces
Organic, per million 0·01
Nitrates, minute traces.

Water from a spring at Waverley.

Three analyses of this water have been made by me in 1875, 1886, and 1889, the two last shewing an increase of total solids compared with the first. This seems to be the result of dry weather preceding the time when the last two samples were taken :—

			1	2	3
Carbonate of Calcium	...	...	1·90	2 85	2·13
Chloride of Magnesium	...	...	2·15	1·92	2·36
Chloride of Sodium...	...	...	3·50	3·53	3·84
			7·55	8·30	8·33
Inorganic ammonia per million		...	0·01	0·22	0·01
Organic ammonia	„	...	0·26	0·22	0·26

Water from sands at Newcastle.

This came from a well sunk in sand at a time when there was no population near the place, it contained :—

Silica...	...	...	traces
Sulphate of Calcium	...	0·23	grs. per gln.
Chloride of Magnesium	...	0·28	„
Chloride of Sodium ...	...	2·81	„
		3·32	
Inorganic ammonia per million		0·20	„
Organic ammonia	„	0·25	„

Residue darkened on ignition slightly, there were no nitrates present and no phosphates. The nitrogeneous matter in this water no doubt comes from the humus in the soil.

Water from Well near Parramatta Street, Sydney.

Oxide of iron and alumina	...	1·11	grs. per gln.
Carbonate of Calcium ...	...	3·54	„
Carbonate of Magnesium	...	3·13	„
Sulphate of Calcium ...	...	traces	
Chloride of Sodium ...	...	14·27	„
		22·05	
Inorganic ammonia per million		0·14	„
Organic ammonia	„	0·09	„

Water from shallow well near Belmore Park, Sydney.

Silica ...	...	...	1·00 grs. per gln.
Oxide of iron and alumina	...	1·20	„
Sulphate of Calcium ...	...	1·27	„
Nitrate of Calcium ...	...	7·60	„
Nitrate of Magnesium...	...	8·28	„
Nitrate of Sodium ...	...	12·65	„
Nitrate of Potassium ...	...	traces	
Chloride of Sodium ...	...	10·76	„
		42·76	
Inorganic ammonia per million		0·30	„
Organic ammonia	„	0·80	„

In these two waters, but especially in the last, the influence of a dense population is visible. The last water which was bright and clear was loaded with nitrates produced by the decomposition of nitrogenous organic matter, and it will be observed that whilst the inorganic nitrogen is high the organic is low. This indicates that the conditions as to presence of basic bodies being satisfactory the nitrifying ferment had full play. If all the nitrogen had been present as ammonia in one form or other, it would have amounted to the enormous quantity of over one thousand parts per million or more than the average of sewerage. This shews that the nitric nitrogen of waters should be taken into account. This well is not far removed from the old Devonshire Street Cemetery, but there is no visible connection between them as deep drainage intervenes. The water is not used.

Another water from a well at Bourke Street, Redfern, contained free sulphuric acid as an impurity, the source of which could not be accounted for unless there was some underground connection with the old Kerosene Works at Waterloo. The water had an acid reaction and contained 3·7 grains of free sulphuric acid per gallon. Neither nitrates nor nitrites were present. It had been used for boilers and destroyed two valued at £700.

Water from the Hunter River at West Maitland the sample being taken when the river was low :—

Sulphate of Calcium	1·38	grs. per gln.
Carbonate of Calcium	2·28	,,
Carbonate of Magnesium ...	3·19	,,
Chloride of Sodium	9·71	,,
Potassium salts	traces	
	16·56	
Inorganic ammonia per million	0·16	,,
Organic ammonia ,,	0·24	,,

Nitrates and phosphates minute traces.

Water from a well at West Maitland near the river and above most of the population :—

Oxide of iron with traces of alumina and silica	1·06	grs. per gln.
Carbonate of Calcium	6·39	,,
Sulphate of Calcium	1·32	,,
Carbonate of Magnesium	7·24	,,
Chloride of Sodium	6·78	,,
Potassium salts and nitrates	traces	
Total inorganic salts... ...	22·79	
Inorganic ammonia ...	0·10	parts per million
Organic ammonia... ...	0·11	,,

Water from a well at West Maitland near the middle of the town:

Oxide of iron, alumina and silica	3·40	grs. per gln.
Sulphate of Calcium	23·98	,,
Nitrate of Calcium	4·61	,,
Nitrate of Sodium	15·07	,,
Nitrite of Sodium	40·59	,,
Nitrite of Magnesium	21·79	,,
Chloride of Sodium	6·43	,,
Total inorganic salts ...	115·87	
Inorganic ammonia	0·14	parts per million
Organic ammonia	0·13	,,

Here we have the same result as that referred to above, viz., the accumulation of nitrogen as nitrates and nitrites in the underground water arising from the excretions of a dense population. Although the water of the river is in touch as it were with the underground water, it is found that in the first well-water the calcium and magnesium salts are increased; doubtless from lime in buildings in the neighbourhood, but there not being much population in its neighbourhood the nitrogenous organic matter has rather decreased. On the other hand all the impurities have increased where the population is dense, and the nitrogenous constituents enormously so. Such water whilst quite unsuitable for domestic use would suit admirably for irrigation, which would be following out the practice of the ryots in some parts of India, who prefer the waters of their village wells to even a canal water for that purpose, the preference being traced to the nitrates in the water which increased the crops from their manurial value.

Water from deep well at Gunnedah.

Silica...	2·53	grs. per gln.
Oxide of Iron and Alumina	·52	,,
Carbonate of Calcium ...	18·22	,,
Carbonate of Magnesium ...	2·83	,,
Sulphate of magnesium ...	30·06	,,
Nitrate of Potassium ...	·40	,,
Nitrate of Sodium	·98	,,
Chloride of Sodium	34·51	,,
Total inorganic matter	90·05	

Of these inorganic matters 19·87 grains were deposited on boiling for two hours.

Inorganic ammonia ...	0·24	parts per million
Organic ammonia... ...	0·08	,,

Water from well at Tamworth, sunk 112 feet in rock.

Silica	1·09	grs. per gln.
Oxide of Iron and Alumina...	7·73	,,
Carbonate of Calcium ...	13·61	,,
Carbonate of Magnesium ...	16·26	,,
Chloride of Potassium ...	33·01	,,
Sulphate of Calcium	16·12	,,
Chloride of Sodium	1·25	,,
Total inorganic matter ...	89·07	

Nitrates absent, Nitrogen organic and inorganic traces.

These two waters are both used for brewing and should be very suitable for that purpose. The quantity of potassium salts in the last is particularly noticeable, as about 22 grains per gallon of potassium sulphate is found in the brewing water at Burton on Trent, at Edinburgh, and in the water from a well at Tennant's Brewery, Glasgow.

Water from spring at Cootamundra.

Oxide of Iron and Alumina ...	5·2	grs. per gln.
Carbonate of Calcium	2·2	,,
Carbonate of Magnesium ...	2·3	,,
Chloride of Sodium	2·3	,,
Sulphates	traces	
	12·0	

Water from a well at Cootamundra.

Silica	0·8	grs. per gln.
Carbonate of Calcium... ...	42·3	,,
Alumina	4·8	,,
Sulphate of Magnesium ...	57·1	,,
Sulphate of Potassium... ...	0·8	,,
Sulphate of Sodium	47·2	,,
Chloride of Sodium	154·6	,,
Total inorganic matter ...	307·6	

In neither of these two waters was the nitrogen determined, the samples being small. It is noticeable in these as in other cases how greatly the salts increase on sinking.

In the two following waters from Wagga Wagga, the first is from the creek and the second from a well at no great distance from it. It seems probable that the latter is the same water altered by filtration through the soil, salts being taken up in passing so as to increase the total saline matter in the well water to nine times that of the creek, whilst the inorganic ammonia is slightly decreased

and the organic ammonia has been reduced to one-half being converted into nitrates in the process, the total nitrogen being at the same time notably increased.

Water from creek—

Nitrate of Calcium	0·33	grs. per gln.
Chloride of Sodium	0·93	„
Magnesium	traces	
Silica, alumina and oxide of iron	traces	
Total salts ...	1·26	
Inorganic ammonia ...	0·22	parts per million
Organic ammonia... ...	0·28	„

Water from well—

Silica	0·86	grs. per gln.
Oxide of Iron and alumina ...	1·50	„
Carbonate of Calcium	6·09	„
Carbonate of Magnesium ...	2·09	„
Nitrate of Potassium	0·15	„
Sulphate of Potassium... ...	0·38	„
Chloride of Sodium	1·17	„
	12·24	
Inorganic ammonia ...	0·20	parts per million
Organic ammonia... ...	0·14	„

Water from well at Orange—

Sulphate of Magnesium ...	3·72	grs. per gln.
Sulphate of Calcium	0·39	„
Carbonate of Sodium	2 59	„
Chloride of Sodium	0·68	„
Silica and alumina	1·17	„
Total inorganic matter ...	8·55	

On boiling for two hours this water gave a deposit of 1·3 grains per gallon. It contained—

Inorganic ammonia ...	0·05	parts per million
Organic ammonia... ...	3·02	„

The organic matter present was very small as tested for absorption of oxygen, it only required 0·321 parts per 100·000 in one hour. This water is somewhat anomalous as containing sulphate of magnesium and a nearly equivalent quantity of carbonate of sodium, but it was distinctly alkaline and the effects observed in brewing with it were what would be expected from an alkaline water.

From a bore put down at Seven Hills water in small quantity was obtained not far from the surface, but in sinking deeper an

abundant supply of brackish water was obtained which stood at a depth of 15 or 16 feet from the surface. The analysis shews that it was about equal to a mixture of 10 parts of fresh-water with 1 part of sea-water, the numbers being—

Sulphate of Calcium ...	...	3·94 grs. per gln.
Sulphate of Magnesium	...	1·51 ,,
Chloride of Magnesium	...	28·84 ,,
Chloride of Sodium ...	...	223·91 ,,
		258·20

The second water is one from a coal seam near Lake Macquarie which was found to have a damaging effect on boilers. It contains

Oxide of Iron... ...	...	traces
Silica	...	4·90 grs. per gln.
Sulphate of Calcium ...	...	3·46 ,,
Carbonate of Calcium	...	2·50 ,,
Carbonate of Magnesium	...	traces
Chloride of Sodium ...	...	81·08 ,,
Carbonate of Sodium...	...	49·35 ,,
Nitrite of Sodium ...	...	3·21 ,,
		144·50

Although this water contains an abnormal amount of salts in solution and is alkaline, there is nothing to account for its action on iron except the presence of nitrite of sodium. Nitrites have been found to act injuriously on boiler plates, and it seems probable that their oxidation to nitrates by a little permanganate or their reduction to ammonia by passing through a filter bed of granulated zinc coated with copper would be beneficial.

In conclusion I may add the analysis of salt deposited from a spring at Queanbeyan :—

Water	18·26
Insoluble	0·42
Chloride of Sodium	60·77
Sulphate of Potassium	0·45
Sulphate of Sodium	0·44
Sulphate of Magnesium	12·38
Sulphate of Calcium	7·28
	100·00

There was no bromine or iodine present.

Discussion.

Mr. C. Moore—I presume the results of the testing of water depend a good deal upon circumstances. For instance I recollect some twenty-three years ago a well where the men got water, and

as the season got perfectly dry it became so salt they could not use it. Precisely the same thing occurs near to Camden, where there is a nursery, and as the season gets dry the water in the creek gets so salt it cannot be used for plants, but when there is abundance of pasture the salt is not perceptible. So it depends a very great deal upon the season. I recollect many years ago passing over the Liverpool Plains, and the water was so salt they could not use it for sheep. This was a very dry season—1858.

Mr. F. B. Kyngdon—I rise to thank Mr. Dixon for his paper. It would certainly be a pity if the data he has been accumulating should be hidden away. It is more fitting that such valuable contributions should find a place from time to time in our Journal. I know of two instances in the city where brewers put down wells to a great depth in the hope of getting good water, and the deeper they went the more salt it became. With regard to the purity of the water from the Nepean, perhaps the heavy rainfall of the last few months may have had a great deal to do with the dilution of the nitrogenous matter.

Mr. H. C. Russell—I should like to ask Mr. Dixon if he has any analysis of the deep well-waters of the interior?

Mr. Dixon—With regard to Mr. Moore's observations, I point out in the paper two or three cases in which alterations have taken place in the various waters in consequence of the changes in the seasons. No doubt too, a large quantity of water falling on the surface of the soil must dilute the water so much that the impurities become very much less. And the same remark would apply to the case referred to by Mr. Kyngdon in regard to the dilution of the nitrogenous matter in the supply from Prospect. With regard to the deep well-waters in the interior, I would like to know very much about these. I have no analysis of any of them. I got some salts from some of the salt-water—it was practically of similar composition to sea salt; and this is the case also with the deep wells in Sydney. This water probably flows from the mountains towards the sea. When you sink down you draw off the waters out of the fissures from which the water is escaping to the sea. The fresh and salt water mix together to an extent depending altogether on climatic changes. As I mentioned in the paper it is of great importance that we should know something of these deep well-waters in the interior. Many people in speaking of salt and fresh water take no account whatever of brackish water. They simply divide the water into salt and fresh water. The fresh water may contain a proportion of salt, and still be fresh water to the taste. It has been found in India. where irrigation is carried on in places where no drainage takes place, that particular patches of ground have been rendered perfectly barren through the continued application of water. This fact should be taken into

account in any irrigation scheme brought forward in a country so dry as a good deal of ours is, and where there is a good deal of soil without drainage. Nothing at all will grow on the surface of these soils, and therefore I think a chemical examination of the deep waters should be obtained, even of the river waters used for these purposes, so that we might be able to judge with some degree of certainty of their effect for purposes of irrigation and cultivation.

Mr. C. Moore—Would it not be well to ask the Government to supply samples for analysis? I believe it would be done without the slightest hesitation.

Mr. Dixon—I am quite sure the matter is of great importance.

Mr. C. Moore—If this were done I feel convinced it would be acted on at once. There would be no impropriety in making the request, and I think we should have more influence than any other body of persons,

Mr. J. B. Henson—I should like to make one remark about the saltness of the soil, and that is the shales extending inland are charged freely with salt. I know in the western suburbs you sink a well in the shale twelve feet deep. That is the limit. After you go below that the water is sure to be salted. I have seen fresh excavations in the shale, and have scraped crystals of salt off the shale. It has been white with crystals of salt, and that at a considerable elevation above sea level.

Mr. P. R. Pedley—In the matter of the salt water wells in the interior, as far as my experience goes in the Cobar district there the wells are remarkably salt. Of course they are very vague terms to use—salt and fresh water; but from my own practical experience I can certify to the fact that the so-called salt water from wells from Hillstone and Cobar contains a large proportion of sulphate of magnesium. The theory I believe is that the soil is impregnated with these salts and that the rain has to a certain extent washed the salt out of the surface of the soil. If you are going to start a garden there you will find that plants will grow, but trees will not. If you put in fruit trees you find that as soon as the roots go down beyond a certain depth the trees fail entirely. The idea is I believe that the larger roots get down into the salt and the vegetation suffers. It strikes me that if they are going to use for irrigation waters the so-called salt water wells the result will be the impregnation of the surface soil and prejudice to the vegetation.

Rev. S. Wilkinson—No doubt the value of an analysis of these waters from a sanitary point of view cannot be over estimated; but there are many other matters connected with the arts of life in which such analyses would be of considerable importance. I know one district in which a very important industry is pursued, viz., the tanning of leather, it being found that the Hawkesbury

waters, which flow through the district, have peculiar properties which render them useful for this particular pursuit. Probably many other parts of the country are suited to this particular industry, and could be proved to be so if we were able to get satisfactory analyses of the waters. We should not then be doing as we are now doing—sending our skins home to be tanned and buying them back again.

The PRESIDENT—I should like to ask Mr. Dixon upon one matter in connection with the changes which he has found in the the composition of the Nepean water, and to know whether he noted the period of the year in which the changes were made, because that might make a great difference. The salts and organic matter in the river waters vary with the amount of rainfall, of course in very wet weather the total amount of salts in solution would be smaller than in a dry season, the variation in the seasons is not so marked here as at home, so that there would be correspondingly less change in the waters. Although the gum trees are not regarded as deciduous trees, still they do shed their bark and that must have an effect somewhat similar to the fall of the leaves in other countries. An analysis of the waters in autumn shows a considerable difference from an analysis made in any other part of the year. Perhaps Mr. Dixon can tell us whether these analyses were made at the same time or not. We know the last two or three years have differed from the previous years in the amount of rainfall. I should like to know too whether any of the waters are likely to prove of use medicinally. Some few years ago we had a short paper upon mineral waters by Dr. Dixon, and I was in hopes we should get a considerable amount of information as the result of that discussion. Then the well waters about Sydney and the County of Cumberland and the County of Camden contain a very large amount of sulphate of magnesium, and I should like to know whether Mr. Dixon has noticed any change in the amount, because it is a thing we might expect that the proportion of salts would vary in the course of years. Then with regard to the application to the Government for a systematic collection of samples of water and analysis of the same, I think that perhaps an application might be made to the Under Secretary for Mines for assistance in the matter. In conclusion I have much pleasure in offering the thanks of the Society to Mr. Dixon for his valuable contribution to the chemistry of the waters of New South Wales.

Mr. DIXON said in reply:—I thank you for your vote of thanks. I cannot bear in my memory exactly the particular seasons at which I made the analyses of the Nepean water supply of Sydney. I have a number of analyses made at different times with regard to the amount of nitrogenous matter, and there has been a con-

tinued decrease. With regard to the medicinal waters I have never seen any waters that could be called medicinal waters here. Any waters I have seen have been brackish waters—that is to say sea salt perhaps with a little excess of sulphate of magnesium or sulphate of aluminium. It seems the surface of the soil still contains salt from the surface of the original sea modified to a certain extent by the oxidising action continually going on.

Mr. MOORE—Have you known of any analysis of what are called soda water wells.

Mr. DIXON—There was an analysis of mine published in the "Mining Record" some years ago.

Mr. MOORE—What is the principle?

Mr. DIXON—Carbonate of soda. An excess of carbonic acid.

Mr. J. F. MANN—Have you seen that chalebeate spring at Mittagong?

Mr. DIXON—I have seen it. There are many such springs. (Mr. Dixon here explained the composition of the water in springs of this character.)

THE ABORIGINES OF AUSTRALIA.

Being Personal Recollections of those Tribes which once inhabited the Adelaide Plains of South Australia.

By EDWARD STEPHENS, Esq., Bangor, Tasmania.

[*Read before the Royal Society of N.S.W., October 2, 1889.*]

I CAN hardly believe it, and yet it is true, that it will soon be half a century since I, a lad with my parents, landed in the infant colony of South Australia. The rains had been unusually heavy, and the country was so flooded, that it was with great difficulty we reached Adelaide, the capital of the young settlement. As is usual with new arrivals in any part of the world, we were out and about very early next morning. Our great wish was to see a native—a real Australian black-fellow. It was not long before our curiosity was gratified. A dog having been killed—perhaps drowned in the back yard—two or three of the genuine aborigines saw, and begged the body of the poor dead dog, and soon were squatting on their haunches around the carcass. On

being asked what they intended doing with it, they replied—"Plenty bery good dog butter." So, with a piece of glass bottle they performed a post mortem, cleverly extracting the internal fat and deliberately smeared their heads, faces, and necks with the offensively pungent mess. So strong was the disgusting scent that we rushed from their presence into the house, closing windows and doors. I do not relate the foregoing as something new, for hundreds of persons have seen the like. I only mention it here to show how I was first introduced to the noble Australian savage. This practice of covering the body with fatty substances is common to all savage races, and is intended as a protection against the bad effects of extreme heat and of extreme cold, as well as furnishing a covering through which the troublesome insect finds it difficult to reach with its proboscis, the rich juices which lie under the skin of—well, even an Australian native.

I have lived to see an aborigine greedily devour a crust of wheaten bread; but, I can assure the reader that, at the time of which I now write, if some bread and meat were given to them they would consume the meat, but on getting a little distance from the house, after smelling the bread they would deliberately throw it away. At that time also they would not eat bacon nor besmear themselves with its fat; and pork was their peculiar aversion. I can say with confidence that, up to my latest acquaintance with them, never once did I see them eat, in any form, the flesh of a pig. It was evidently naturally offensive to them.

We soon left the little city of Adelaide, for it was really little then, and not many thousand people in the whole colony. There was no bishop; Sir Henry Young was Governor. Our temporary abode was to the east of Kensington, and not much more than a mile to the north of Green Hill. Kensington could boast of only one public-house or shanty, which was kept by an African, and one small place of worship in which officiated a Mr. Strongman. Another gentleman conducted the Sunday School, and, I regret to say, that on one Sabbath morning the curiosity of some natives prompted them to look in at the door, the said superintendent drove them away and shut the door in their faces. There was a store in this village and but a very few other houses. The mainstay of the place was the local brickyards and the sawing and splitting of timber on the Mount Lofty tiers. Our place lay near one of the tracks used by the aborigines in passing backwards and forwards from the Adelaide Plains to the Bremer and the Murray River. As population increased and the Adelaide natives abandoned hunting for a vagrant begging life, they but seldom passed over the eastern ranges; but the Murray blacks would still come down, perhaps twice a year. These blacks, even in the earliest days of the white settlement, were a race far superior in

stature and general physique to those of the plains; caused no doubt, by the abundance of fish which were easily caught, and by their indolent peaceful life. But few of the men were under five feet nine or ten inches, and many of them were more than six feet high. Their only defect, in physical stature, was the extreme leanness of their legs compared with an otherwise wellbuilt and massive bodily organization. In fact their legs, in more ways than one, were their weak points; for a blow on the head that would almost fell an ox, would hardly stagger them or make them blink their eyes; whereas a light tap on the legs would vanquish them at once. On one occasion, a huge black-fellow, for some reason known perhaps only to himself, was in the act of launching his waddie at the head of a bullock-driver, but the latter brought his whip with one smack against the legs of the black, and he seemed as incapable of offensive exertion as if he had been instantly paralysed by a shock from an electic eel. What, however, the blacks of the plains lacked in physical robustness was more than compensated for by their lithe and wiry agility. They were bold and persistent in hunting, and courageous in war. Yet, as a rule, when the hill tribes descended to the plains, those of the plains would retire as if by a mutual compact. Of their conduct in an actual tribal fight I shall, as an eye-witness, have something to say further on.

As a lad, I was rather partial to the native children, and they in return became rather fond of me. I was led to see that the proper treatment of the aborigines consisted in kindness combined with firmness, and the avoidance of as much as possible, the making of presents, as these as a general rule, only tended to excite jealousy towards those who received them, and ill-concealed hatred of those who bestowed them, in the hearts of the neglected ones. They only required a fair reward for services rendered, the non-exhibition of fear, a kind and manly speech, and the keeping of them at a respectful distance. I may remark that neither the Adelaide nor the Murray blacks who came under my notice, were as low in the scale of humanity as some writers have depicted them. Apart from the one offensive habit of covering themselves with fat, they were clean in their habits; not ungenerous in their disposition; and their heads were comparatively free from vermin. Both fathers and mothers were fond of their children. The mothers were particularly attentive to the wants of their little ones. And I can easily understand how a number of Europeans, being compelled by the force of circumstances, to live together in the same way as these natives lived, would not have presented a more agreeable aspect, or happier conditions, than were presented by the aborigines of Australia. In judging of the type of a class of people we should not lose sight of the nature of the environment in which

they are born and compelled to exist all their days. And viewed from a moral or domestic platform, the advent of the white race was to the native race anything but an unmixed blessing. However, with this I have little or nothing to do, although knowing as I do the many evils that the white race has inflicted upon the black race, I can hardly resist the temptation to state what I know.

I have, more than once, been highly amused when a lubra (this was the common name applied to both fathers and mothers) was engaged in earnest conversation with my mother, while the large dark eyes of a little bit of blue or slate coloured humanity would peer over its mother's shoulder, and fumble about its mother's neck, very plainly indicating its want of nourishment ; the mother (still continuing her conversation) would quietly push her breast up to the child. The little hands would grasp it eagerly ; and, applying its mouth to the proper place, would most energetically drink in the coveted fluid, until exhausted with its agreeable occupation it would speedily fall asleep. If it were the mother's first child, and it very young, the operation had to be performed in another way. The mother would slip the child round under one arm, and in that horizontal position the baby's hunger would be appeased. The little ones were washed regularly and kept scrupulously clean ; and strange to say, they did not foul the enclosure in which they were carried, as white children most surely would have done ; but by their restless movements, perfectly understood by the mother, they would indicate their condition, and so the calls of nature would be promptly attended to. On account of my extreme youth, for I could not have been more than seven years of age, I had facilities for witnessing those little domestic and motherly attentions which would have been denied to an adult male. In fact in the presence of the white man, their native modesty would have prevented the discharge of these necessary duties, and that neglect through extreme modesty, would have insured undeservedly, the charge of dirtiness. As an instance of their innate modesty I will mention one case :—About twenty years later, away in the north-western part of the colony, I was asked to visit a poor old black woman who was said to be dying. On reaching her wurley, or little hut of bark and boughs of trees, I found her to be in the last stage of the aborigines great enemy —consumption, or perhaps it might be designated more correctly as pneumonia. Her case was hopeless, and when she was in almost the last agony of mortal dissolution, I was astounded at her efforts of concealment, indicative of extreme modesty. As I drew her opossum skin rug over her poor old emaciated body, the look of gratitude which came from her dying eyes, told me in language more eloquent than words, that beneath that dark and

dying exterior there was a soul which in a few hours angels would delight to honour.

The following will furnish another illustration, and will afford a little amusement on account of its comic element, and its *argumentum ad verecundiam* by a black lubra. Respecting the feelings of the living, I use fictitious names. Sir Roger de Coverley being a visitor to the colony and the lion of the hour, a corroboree on a large scale was arranged in his honour, not a hundred miles from Hindmarsh Island. Wishing to give an additional zest to the performance, the Hon. Roderick Random requested the black women to undrape and perform an antique dance representing innocence without her clothes. The reply came sharp and crisp, "What for white-fellow wantum black woman dance likeum that? You askum white lubras jump about mid no clothes: you hear what she yabber yabber." Mitford, one of Australia's greatest humourists, published an apology in words something like the following: "It was evidently a misapprehension on the part of the native woman, due no doubt to her want of a correct knowledge of the English language. We are in a position to state, that the Hon. Roderick did not ask the native women to dance in a state of nudity. He simply requested them as a favour to their illustrious guest, to kindly dance to a *new ditty;* hence the unfortunate mistake."

Those who speak of the natives as a naturally degraded race, either do not speak from experience, or they judge them by what they have become when the abuse of intoxicants and contact with the most wicked of the white race have begun their deadly work. As a rule, and to which there are no exceptions, if a tribe of blacks is found away from the white settlement, the more vicious of the white men are most anxious to make the acquaintance of the natives, and that too, solely for purposes of immorality. The native women have hearts to break, and the native men outraged honour to vindicate, and these have ever been the chief factors in the so called attrocities of the aborigines of Australia. I saw the natives and was much with them before those dreadful immoralities, were well known. I saw them and was often with them, when the old died off and the race no longer propagated itself, and I say it fearlessly, that nearly all their evils they owed to the white man's immorality and to the white man's drink.

As late as 1879, I knew one brave old chief or king, who when he could no longer restrain his tribe from yielding to the degrading customs of a degenerate white race, retired with his only son to spend his remaining years in the seclusion of the Wirrabara forests and mountain ranges north of Beetaloo. This case was first brought under my notice by Mr. Daniel Kearney, then the genial and respected overseer of Booyoolee Sheep and Cattle

Station. That is an instance which goes far to show that the race was not so degraded as some writers and explorers would have us to believe. If the lips of our medical men were not professionally sealed they could make the cheeks of Christendom blush with shame at what their patients have done and suffered in the back settlements of Australia. The contagious diseases of large cities were unknown to the aborigines of Australia before the advent of the white man. I have seen the white man and the white woman more degraded than the worst aboriginal of South Australia. Many years ago, I should think nearly thirty years, a few men of a northern tribe returning under the influence of drink from a western township, committed an atrocious crime, which filled with horror the whole of the white population. After violating a shepherd's wife, they murdered her and her children, and concealed the remains of their victims in wombat holes. One man turned Queen's evidence, and the other murderers were hung. Now this point I wish particularly noticed, that he who turned Queen's evidence was banished from his tribe. What became of the shepherd? Well the last I heard of him was that in return for the kindness of a neighbour in taking him into his house and sympathising with him in his terrible trouble, he ran away with his neighbour's wife and the two lived in adultery.

Again some have said of the Australian as they have said of the African race, that they were incapable of mental improvement. The latter, thanks to an unconquerable racial tenacity of life, have belied the statement; but the former never had a chance until the time was too late, The fatal mischief was done. The barriers of personal modesty and tribal honour were broken down; and, too late for preservation, the mere fragments of a once numerous and scattered race were collected for christian burial at Poonindie or Point Macleay. One could no more judge of the character of the aboriginal Australian, from the samples collected at these Christian Stations than the grand national characteristics of the English race could be understood from the patients of a casualty hospital or the inmates of a lazar-house. Cottrel, a full-blooded native, has sat at our table and dexterously manipulated his knife and fork equal to the usages of middle class life. He was an agreable companion, interesting in conversation, full of anecdote and adventure. I lost sight of him for a long time, but I heard at last that he had married a white woman and was settled comfortably near the Bremer, on land which was given to him by the South Australian Government; and should the seasons prove favourable, there was every prospect of his success as a farmer. If still alive he must be nearly seventy years of age. To see him track, or smell the tracks of his own bullocks that had gone astray

with a number of others, was a sight long to be remembered ; and in the success of finding them he never failed.

Many persons have given expression to the opinion that their religious beliefs were very superstitious and low—in fact they had but little or no ideas respecting a future state. Here, I ask, would it be just to the whole of Christian England, to estimate the nature and value of its theology from an attempted exposition of the thirty-nine articles, or Athanasian Creed of the Church of England by an ignorant, drunken, and degraded denizen of the purlieus of Whitechapel? Yet this is precisely what has been attempted with regard to the religious beliefs of the aboriginal Australian. That their religion was far below Christianity goes without saying. But it was far and away more simple and sublime than many of earth's religions which possess a refined literature and are held in respect for their venerable antiquity. The fact is the adult aborigine would not converse with the adult European about his religious beliefs. Upon this they were specially silent and profoundly reticent. What he would often glibly discuss and what white men have understood to be a part of his religious beliefs was no more that than the fairy tales of Scandinavia are a part of the theology of Sweden. An adult native would sometimes talk to an attentive child who was his son's playmate ; and from the children I have gathered a little knowledge upon this question which briefly stated, amounts to this :—They believed in a good being who sent them good things, and that he specially ruled the day. Also in a bad being who brought them evil things, and who ruled in darkness or the night. That the moon and stars were messengers of the good one to see that the bad one did no great injury to them. At death they believed that the thinking and talking principle passed away to the east, whence came the sun and moon ; that there they would all meet at last. And whilst possessing great confidence in the good being, that all would turn out well in the end, and were anxious not to do wrong by committing murder, theft, and avoiding Coonyownda, that is the eating of tabooed female animals ; they had no idea whatever of vicarious sacrifice, and the utility of prayer. This was the substance of all I could learn, and I believe it was all that they were able to impart, When the white man came, additions were made to their limited theology ; and some thought the white man was only an aboriginal changed in colour on being raised from the dead.

There were audacious Europeans who had the temerity to tell them that they, the white men, had once been black ; had hunted on the plains ; had actually died and returned from the spirit land. Such statements as these, backed by drink, gifts of tobacco and immoral actions, so confused the minds of the natives and so disturbed their ancient beliefs, that when in after years missionaries

began the attempt to restore this lost Eden, they found the native doctors demoralised or dead, the office gone, and no one left able, even if he were willing, to give any clear idea of the religious beliefs of his own father, and as for himself he had none to give. Drunkenness and debauchery spread like their own bush fires, and it was not until tribe after tribe became extinct, that intelligent men awoke to the fact that an interesting people had perished, and that most of their traditions had perished with them. The traditions of the advent of the first blacks were extremely vague. They seem to believe that they came from the north-east, soon after there had been a tremendous flood, when rocks rolled down from the eastern ranges and floated like wood across the plains. Whether this was or was not, a flickering glimmer of the idea of a general deluge which is so common a belief throughout the world, I am unable to say. I was too young to theorise, I was only able to remember statements and actual facts. Before I was twenty years of age all the aborigines from Rapid Bay on the south to Gawler on the north were nominally, if not absolutely extinct. My old playmates had prematurely aged and had died off one by one, under the imported vices and diseases of the white men.

In the early days referred to at the beginning of this paper, some of the men of the eastern tribes called at our place on their return inland, and possibly suffering from "hot coppers," from the effects of a debauch with the whites on the Adelaide race course, were very demonstrative in their demands for drink and "tucker." The first was given in abundance, but as the latter article was very scarce in the house, it could not be supplied. These men, I think belonged to the Goolwa or Encounter Bay tribes; and through an early intercourse with whalers and sealers who visited that locality, were much bolder than those with whom we had been acquainted. There being only my mother and myself at home and the nearest neighbour some distance away, the men became very bold and bodily entered the house. We had a nice lively little magpie at the time which we had tamed and taught to say a few words and to whistle—"There is na luck about the house &c." The magpie hid himself under the sofa, and, singularly incredible as it may appear, it, in a rich full clear tone whistled the tune, "there is na luck, &c." The natives were strangely silent in a moment. In less time than it takes to pen the words, little mag was out from her hiding place, biting the naked toes of the savages here, there, and everywhere, and talking at a tremendous rate. They all looked like a lot of scared demons, and madly rushed for the door, as if the old general himself were after them. The door was instantly closed and bolted. The blackfellows never returned and never knew but that the words came from an avenging spirit, and that they had had a very narrow escape.

As all the sports and pastimes of young and old had reference to hunting and fighting, in which spear and waddie throwing formed a prominent feature, it is no wonder that their accuracy of aim became so perfect as it did. To those unacquainted with their habits of life, their spear-throwing was a very near approach to perfection. Particularly was this so with a spear made of a reed which grew in the waterholes of the Torrens and elsewhere, into the end of which was inserted a piece of flint or a nail; or a spear made partly of reed and partly of a piece of wood, one end of which was brought to a fine point and hardened in hot ashes. These were used for wild fowl; and, to see with what ease they could creep up to and spear a wild duck or bronze wing pigeon, was truly surprising.

To the south of the grog shanty in Kensington, of which I have written, there was a nice piece of cleared land—in fact this was about the only well cleared piece in the village. Norwood and Kent Town were unknown then. The site of the present Norwood was then a magnificent gum forest, with an undergrowth of kangaroo grass, too high in places for a man to see over; in fact persons had lost their way in going from Adelaide to Kensington in those days, through attempting a short or near cut across the country. The only house between the city and this out-in-the-bush village was one newly erected by Dr. Kent on the edge of the east park lands. On the memorable Christmas afternoon a large number of settlers had met to spend a merry hour or two. Small loaves of bread or damper were obtained—Johnny Cake the latter was called. These were baked not in the ashes as the damper proper was. They were about half an inch thick and six or eight inches in diameter, and were baked by being stood upright before the fire, supported by little sticks. These were the targets that men had collected at which the blackfellows were to throw their spears. The distance began at about twenty-five yards and was gradually increased to perhaps seventy or even one hundred yards. It was remarkable with what accuracy and certainty the natives would, in nearly every case, send the spear into these objects. At this time much of the prejudice against bread had passed away, and these Johnny Cakes, well smeared with treacle, were received as a great luxury. The spears were thrown by means of the wōmmera or meēdla, as most natives called it. This was a flat piece of wood about two inches broad at the middle, tapering off towards each end in rapid curves with knobs at the ends. In the upper knob, and pointing towards the hand, was inserted the tooth of a kangarro, securely fastened with the sinews from the kangaroo's tail. The other end was simply a knob to prevent the wōmmera from slipping through the hand when the act of projecting the spear was complete. The point of the tooth was pressed

into a hole in the blunt end of the spear, the other end of the wōmmera was held by the third and fourth fingers of the right hand, resting on the palm of the hand and between the finger and thumb. The first and second finger and thumb grasped the spear. The hand, with the spear, being raised and drawn back—the distance almost instinctively judged —then the spear was thrown with all the force necessary, and being propelled by the wōmmera, which acted with the leverage of an additional and very long arm, the distance that could be covered was something enormous. These spears were but seldom, if ever, used in battle.

The waddie was simply a small club, and was a general utility instrument in the hand of a native. Its head or knob was rounded off in such a way that it would slip through the boughs of a tree like a thing of life, and fall to the ground; whereas the white-man's poor imitations would in nine cases out of ten, remain lodged in the boughs of the trees into which it might be unfortunately thrown, and, in the case of us boys, involving hours of stone and stick pelting to get it down again. There was also a short double ended sharp pointed spear for kangaroo and emu, and the large fighting spear, perhaps twelve feet long with ugly barbs at the end, often at each end. It was not unusual to hear an aborigine speak of the good qualities of his spear much after the manner in which sportsmen boast of their guns. Here is a specimen of the black-man's eulogy:—"Berry good spear that one. Him die plenty blackfellow." Grim enough in all conscience, but the number of blackfellows killed really indicated the number of battles in which he had distinguished himself; thus the spear unconsciously reflected the honour of its owner. It certainly had the merit of being a very delicate way of blowing one's own trumpet. There was also the climbing stick, one inch in diameter, eighteen inches or two feet long and chisel pointed. This was used for cutting steps in the bark of trees when the owner was hunting opossum or searching for bird's nests. Allow me to remark here that a blackfellow only put his big toe in the step he made, and with it he supported the weight of his whole body while he cut out another step. If the present generation think that to be an easy thing, I would advise the over confident to support his whole weight on one toe, resting say, on the edge of a sofa, while he counts thirty-five. To resume, these steps were enormous distances apart, quite four feet or even wider distances, and yet these people would climb with ease, and what was still more surprising, descend again without difficulty or danger.

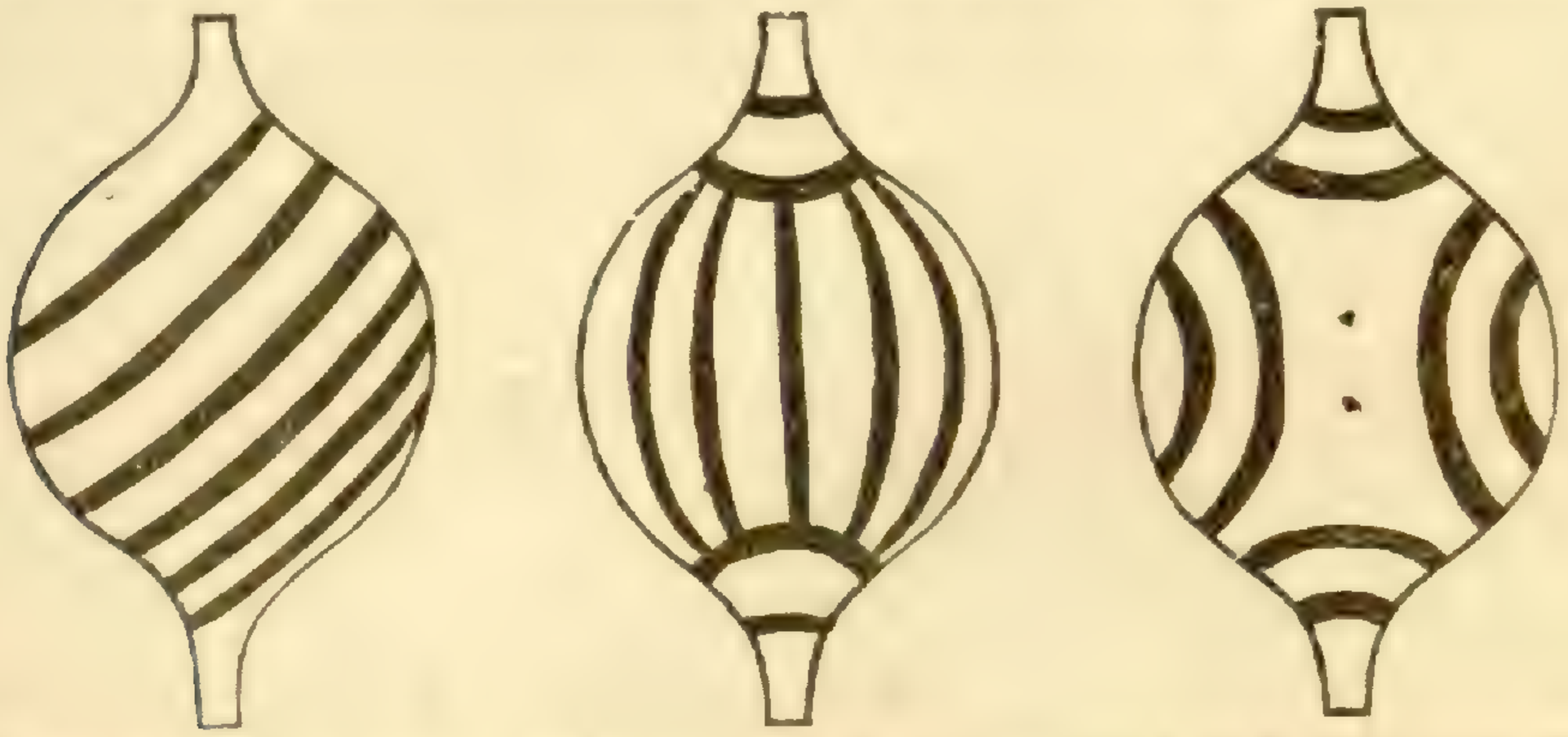
They had also the boomerang, about which much has been said. Its shape was so peculiar that when thrown as a blackfellow only could throw it, and should it fail to hit the object aimed at, it would pursue a singularly erratic career and return with great force to

the one who threw it. It was a dangerous instrument in the hands of inexperience ; for although thrown with vigour at a foe, it might in its peregrinations, attack your dearest friend. It was not long before the climbing-stick gave place to an iron bar, similarly shaped, and the hatchet, nail, and hoop iron have taken the place of flint and the kangaroo's tooth. I have lived also to see the sinews and tooth, which from time immemorial, were used in the manufacture of opossum rugs, discarded by the noble savage for needle and whity-brown thread ; but the rugs were not improved. Unlike the tribes inhabiting Queensland and the Northern Territory, these had no permanent shields. They only fought in the spring of the year when the sap was flowing freely in the trees, and the bark could be readily taken off. Out of this bark they made their shields, which were only intended for temporary use—after the battle they were thrown away. To be able to regulate the time for war and to divert or control the surging passions of a tribe of fire eaters must have seriously exercised the diplomatic skill of some minds. That they only fought in spring was nevertheless a fact. Strictly speaking the aborigines were not a fighting race, and there was no necessity that they should be. That picturesque amphitheatre of hills, which, sentinel like, guards the plains of Adelaide, and situated as it is eight or ten miles from the sea, was a safe retreat and a natural protection against an enemy from the coast. And, although the eastern tribes would be down at times on the rampage, there was nothing sufficiently attractive on the plains to tempt them to remain away from the luxurious lives which they enjoyed on the waters of the Murray—the monarch of Australian rivers. Hence, to these tribes of the plain, fighting was not a prominent and necessary art. But they could fight, and most effectively too, when necessity called them to defend their wives and children, and their ancient hunting grounds, from an invading force.

On one occasion by some means, either with or without her consent (I think it was the former) a gay young spark "rine yah me teen ter can nay moon cara"—in other words, a marriageable young man of the plains, stole a nice young woman of the hill tribes and the result was a declaration of war. For days, hooting and yelling messengers passed from camp to camp. This sort of aboriginal ambassadorial, and yelling diplomacy continued for nearly a week without any satisfactory results I suppose the blacks of the plain were thought to have had the best of the bargain, because neither king, priest, father, mother, brothers nor sisters, nor the whole fraternity of relations, could induce the captured maiden to renounce her gallant Leander. So the Murray blacks resolved to take her, or at least "to know the reason why." Meanwhile as the sap was up in the trees as high as the blood in their bodies, they prepared for the contest by stripping the bark from the

white and blue gums, in pieces of about three feet by two feet six inches, out of which they made their shields. When finished each shield was about two feet six inches long by two feet wide. The handle was fixed in the centre from the back, and consisted of strong tough pieces of green wood twisted like a rope, with each end thrust through holes in the shield and firmly wedged. The face of the shield was rubbed smooth with stones and hardened by being put in hot ashes over which was placed a layer of live coals. When properly "done," it was allowed to cool, after which it received a coating of pipeclay or lime, and then was ornamented with red bands made of the juice of a small tuber which grew in abundance on the virgin soil. The warriors themselves painted their faces, arms, breasts, and legs in a manner which gave them a most hideous expression, calculated I suppose, to inspire feelings of dread in the minds of their enemies; but as the adornments were given to both parties, I should imagine that the dread would be mutual.

I now give an illustration of the shields, with the devices they bore, remarking by the way, that, the cross being so simple a device it would naturally be expected that it would be the first to suggest itself. There was however not the least attempt at producing it, even in rude outline, nor were the forms either of bird or of beast pourtrayed. Among the many styles of embellishment the following will serve as illustrations. If the reader can imagine 300 or



400 warriors on each side in all their panoply of glorious war, marching in line with shields as here depicted, and "the quivering spear uplifted high," he will admit that war, even among the aboriginal Australians had its serious aspect.

This event made such a deep impression on my memory, that I was not likely to easily forget the least circumstance that came under my notice. For weeks after, the usual boys' games were suspended for mimic war on native lines, in which shields and spears, and at last stones began to play a dangerous part. The morning of the day of battle dawned, and by ten o'clock both

forces were in motion. Scouts were thrown out. The battle-field selected was a clear space of a few acres a few hundred yards to the east of Mr. Gwynn's residence (he was a lawyer then, in after years he became one of the Judges of the Supreme Court). On reaching the ground, each side formed itself in single line, facing each other, separated only by a space of not 100 yards; the women and children of each tribe occupying the rear of each side respectively. Then followed more palaver, or yabber yabber, degenerating at last into language more expressive than polite, and of an extremely personal character; in fact each side did its best to "rile" the other. The "riling" was as mutual as the abuse was reciprocal. Where was I all this time? Well, I followed the Murray tribe for some time, at a very respectful distance, and at last perched myself where I was out of danger but could see and hear all that my curiosity desired. Unlike the Americans they never fought among trees, and unlike the Europeans there was no danger of a stray shot. I was safe. Their fundamental law of battle was a most humane one, and that was, the side which had the first one, or at most two, killed, must accept defeat; then each party would retire to its respective camps. There was no such thing as a war of extermination with these tribes. If my memory does not deceive me, I do not think the same inter-tribal law held good on the immense Peninsula of Port Lincoln, on the western side of Spencer's Gulf. The signal for battle was given, and out shot from both sides a volley of spears—the sharp pointed ones used in hunting large game. These were neatly caught on the shields. The descent of the spears, as they reflected the light of a brilliant sun, - both sides being moved by one impulse—and each shield catching its respective spear at the same instant the whole scene, for a moment, had the appearance of a magic temple from fairy-land, whose aerial roof was made tangible by the lines of moving spears, and supported by telamonic columns of living men. This sort of thing might have gone on till the youngest brave was grey-headed, and no one would have been hurt. Presently their passions became more inflamed, and then began as lively a bit of fighting as the most inveterate fire-eater could have desired, and called into play all the attention that the quick-eyed men could command. Some spears flew in graceful but deadly curves through the air, while others hissed along, like so many flying serpents, about a foot or so from the ground. The shields were now up, now down, as instant emergency required. The lines drawing closer, one of the Murray tribe had a barbed spear clean through the calf of his leg; the spear had to be broken to get it out of the wound. Things at this moment began to look critical, when a posse of mounted police, which had been sent for and hurriedly dispatched from

Adelaide, galloped forward and stopped further bloodshed. I am not writing a romance, but am recording what actually took place, and what I saw myself. No doubt the old police journals of the forties or very early fifties have preserved the record of this event. Under a threat of being shot at, proceedings between the contestants were stayed for a time. The women and children taking care of the spears, the men were allowed to fight out their grievance and vindicate their soiled honour with waddies! Shades of Homeric heroes, what a sight! and oh! for a second Homer to picture this shock of arms! The scenes which followed were the most weirdly grotesque that human brain could conceive, or human eye gaze upon. Imagine 700 or 800 painted savages with painted shields, yelling like demons and hurling at each other 800 waddies, all on an area of less than an acre. The waddies were thrown with amazing rapidity; some met in mid-air and went up like a pair of newly married sky-rockets. Those that came home to the object aimed at, were parried by the shields, and, going over the contestants' heads, they glittered in the sun like a shower of twenty-inch icicles; falling in the rear they were secured by the lubras and children, and handed to their fighting husbands, or fathers, as the case might be. Sometimes a waddy would be received obliquely on a shield, which was otherwise held upright, the result was it would glance against the head or face of the right or left hand man; should it hit the head no evil would follow, as the thickness of the skull was an unfailing safeguard against concussion of the brain; but should it, unfortunately, find its way to the region of the stomach, then followed a fearfully explosive grunt, a sudden collapse of all martial ardour, and a speedy retirement to the rear. These events tended to break the order and discipline which, up to this point, had been well sustained. Then followed a fortuitous and promiscuous mixture, outvying a hundred full blown Donnybrooks; hard hits were resisted by harder heads, until both parties were exhausted, and the result was, in the language of the football and cricket field "a draw." No lives were lost—thanks to the presence of the police, and but little damage was done, whilst as to vindicated honour, it was, in the words of the drill instructor, "as you were."

On returning they saw about a quarter of an acre of luxuriant sow thistles on our land. Some of them asked if they might have them. I obtained the requisite permission, and told them that they could take the lot. In a moment they had climbed the fence, and this little plot was one seething mass of men, women and children. Ten minutes later the ground was bare of thistles, and the tribe passed on gratefully devouring the juicy weed.

As the fight was about a young woman who appeared to prefer a marriage into the Adelaide tribe to a return to her own, I may

remark that the marriage ceremony was a very simple affair; it consisted in the bridegroom giving a slight tap with a waddy to the bowed head of the bride—not that skull-cracking blow which fiction writers have described. The ceremony was symbolical of the voluntary submission, on the part of the woman, to the lawful authority of the man. In the early days the people were chaste in their lives, and conjugal infidelity was almost if not altogether unknown; but with the advance of civilization, I saw enough to convince me that, in addition to the imposition of heavier burdens, the women were treated with increasing neglect. As an instance of the degeneracy of the times I will mention one case. One day I saw a native, who had passed the middle age of life, climb a tree in search of an opossum. After tapping a hollow limb he ascertained the locality of the animal's nest. Then, with his hatchet, he made a hole some two feet from that spot and nearer to the entrance of the hollow limb. Taking a green stick about an inch in diameter and two feet long, after splitting the end into several divisions he inserted it into the newly-made opening, pressed it tightly against the animal, at the same time twisting the stick, which thus caught hold of the animal's fur and skin so that it was helplessly drawn from its resting-place. Catching hold of its tail he swung the opossum against the tree, putting an end to its life with one blow. Dropping it to the ground he quickly descended, and I had an opportunity of witnessing a superb piece of native cookery in the days of native degeneracy. The roasting consisted in burning off the fur. That being done he took the untoothsome delicacy off the embers, and proceeded to carve it for his wife and his only son—a lad I should judge to have seen a dozen summers. Carving without a knife and fork was to him no difficult feat. Taking the tail near the stump in his mouth, and grasping each hind-leg with his right and left hands, then closing his eyes he forced his arms apart, and the joint was in three pieces. The tail, backbone and head he gave to his son, the sides and legs he reserved for himself, and, incredible as it may read, he threw the intestines over his shoulder as the portion for his dear wife. She picked them up with a look of gratitude! the way in which they disappeared down her throat would have alarmed a professional macaroni gourmand of sunny Italy; the entrails passed out of sight, and her sweet pouting lips looked like . . . (the reader must fill up in imagination what my pen refuses to describe.) And so the repast was ended, to be followed by sleep and peaceful dreams until the demands of hunger impelled them to fresh exertions, which would not be for the next twenty-four hours. Ten years before that same man would have treated his wife as himself. The cooking would have been perfect, although the system of carving would have been the same.

"Coombanee" was a word which meant to roast or fry, that is, to expose the object to the direct influence of the fire; but if the object was to bake the joint, the word "Caānyanee" was used. Their mode of baking a duck, pigeon, or particularly a turkey-buzzard produced highly satisfactory results. The turkey, for instance, was enclosed in a thick coating of clay, no feathers were taken off; it was placed in hot ashes, covered with a layer of coals, and when cooked it was taken out; the feathers would adhere to the clay leaving the fowl deliciously clean and appetizing.

When hunting on a large scale, they would make nets about five or six feet wide and perhaps forty or fifty yards long with large meshes; the material used was a kind of native flax, which grew abundantly on the Murray and in such swamps as existed between Port Adelaide and Holdfast Bay. These nets were fixed in a semi-circular form in a suitable opening in the scrub where kangaroos were likely to be numerous. The most active men were stationed near the nets to kill the animals as they were caught, after being driven to that point by the other members of the tribe. Such game, with emus, abounded on the plains and in the smaller scrub from a little north of the Torrens to the Wakefie'd. The result would be a huge tribal feast or gorge lasting for several days. Instances were frequent where those who were uncomfortably full—and that meant an extraordinary distension of the stomach—mutual help would be given and received for the purpose of obtaining relief. One distended native would lie down on his back or stomach while another would roll him from side to side, then mounting the prostrate form would gently tread him into comfort and convalescence.

Although the natives were extremely fond of dogs, and they soon obtained large numbers of poor mongrel and mangy descendants of those that had been imported by the Europeans, I do not remember a single instance of their training a dingo or native wild dog. This statement may seem strange in the face of a common report that they did tame these animals and employ them for hunting purposes.

All the living things which they caught were for purposes of food or for barter with the white-man. Their ornaments were of the most primitive description and for temporary use only. They were mostly the feathers of the white or pink cockatoo. This was surprising, as with very little trouble they could have produced attractive adornments with the varied and brilliant plumage of the many splendidly coloured parrots which in countless numbers swarmed in their forests and on the plains. In cases of illness they were not without simple means of cure. Emu oil was used for pains of a rheumatic nature; and for sore eyes or sandy blight masticated gum-leaves were an infallible remedy, applied as a

poultice. But as their civilized degredation increased they seemed to neglect these remedies and often appeared with eyes horribly inflamed and disgustingly dirty. As however their diseases were but simple and few, they were inclined to indulge in the use of charms, which of course gave nature a chance of curing herself. But for common wounds and bruises, chewed gum-leaves or the application of dry earth were their chief remedies. With regard to snake bites, I do not know if they used gum-leaves in their cure. I must however say this, that, although always walking through grass and scrub, without covering on leg or foot, and although they killed and ate large numbers of snakes, I never heard of a blackfellow being bitten by one. This always appeared to me to be a most singular fact. Again, so fond as they were of snakes killed and cooked by themselves, nothing would induce them to eat a snake that a whiteman had killed. They always remarked—"No good that fellow." A friend of mine suffering from a severe catarrh and violent pains in the head, was cured by a native in less than half an hour. The blackfellow placed his patient near the fire. Warming his hands at the fire he would instantly clap them to his patient's ears, rubbing vigourously but not roughly. This he repeated without intermission. Presently he began to blow with his breath on the head and neck of his patient, still heating the palms of his hands and applying them to the ears; then he commenced to hum a sort of song or charm; a peculiar sensation came over my friend, he seemed to hear something "give way," or burst in his head. The cure was complete and no ill effects were felt afterwards.

To obtain fire they always carried two pieces of the dried stems of the grass-tree. Sitting on their haunches they placed one piece horizontally on the ground, holding each end with their feet. In the centre of this piece was made a little indentation, into which they inserted the end of the other piece of grass-tree. Then by twirling it backwards and forwards with great rapidity, caused by rubbing their hands together whilst holding this piece of stick perpendicularly, with its lower end pressed firmly into the aperture already named, the friction was sufficient to produce fire. But to produce fire in the shortest possibile time, two persons were necessary. Thus, while one was twirling the stick the other would be busy applying small bits of dry grass or powdered leaves, and ready at the first sign of a spark to blow it into a flame. These two sticks used in the way described, formed their only plan of producing fire. This method was so simple, and in their hands so effectual that they needed no other. I have known them to carry fire sticks in going short distances, but this was very rarely done At their camps, as a general rule, each family had its own fire which was immediately in front of the wurley. These wurley's were

usually made of four or five stakes about seven feet long, some of them forked where they met in the centre, the other ends being driven into the ground, at distances sufficient to give a central elevation of four or five feet. These were covered with boughs and bark, and, in some cases, with grass or reeds and rushes, and were wonderfully wind and rain proof. Their form was that of a divided hollow cone with the open side away from the wind, and fronting the fire. The natives slept with their feet towards the fire, their backs close to the wurley where it touched the ground, and their heads nearly at the centre of the half circle; so that if awake they had a clear view of the fire and of the approach of any visible danger. These places were built in a row, and should the wind change, they had only to make a hole in the back of the wurley and use the material from it to fill up the original doorway. I do not think that either wind or rain would induce them to make that alteration at night. They were very timid in the dark, and particularly so, if rain put out their fires, which was often the case as their fires were only made of small sticks. Their powers of vision at night did not seem to be nearly so great as those of the white man; but in daylight, their range of sight far surpassed that of the European. This was observed in their simple and unexpressive gestures when pointing to anything a long way off, not that they were incapable of energetic expression when the search was minute and urgent. Although I could make a very fair imitation of the aboriginal wurley, and do many other things pretty well equal with themselves, yet I was never able to produce fire in their way. I have tried it repeatedly but could never get beyond the production of smoke.

In the performance of their corroborees, more than the usual quantity of fuel would be supplied to their ordinary fires; and while the old men, women, and children supplied the vocal parts, and beat time by striking their waddies on little mounds of earth mingled with grass, the middle-aged and young men performed their portion on the other side of the fire—retiring into the darkness or advancing to the light, as the sentiment required. The whole affair would conclude with a brilliant tableau in which the natives showed their agility by dancing, with naked feet, on the red coals and scattering them in all directions. They never beat time on skins: such a rough practice would have made it impossible for them to have supplied themselves with rugs for necessary wear. The following will give some idea of the musical part of the corroboree. There was no variation, except in expression and intonation. The children would sing it first, then the women, after that the men, and lastly all together, concluding with tremendous "oughs" or grunts. The song:—

Nāck-a nāck-a-nā nāck-e-nā
Yēn-a yēn-a-yā yā yēn-a yā
Oū-wa-rā rā oū-wa-nā nā nā—
Ngough ! ngough ! ! ngough ! ! !

Of course the words had no more meaning than "Ri fol didder rol" of the old English songs, or the "fal lal" of one who knows the music but not the words of a song.

I hope that none of those who read this brief record of my own observations, will think that I desire to set myself up as an authority above all others. From my earliest days nature favoured me with great powers of observation, and a keen sight, which when put to the test has afforded astonishment to my friends. Even now my powers of vision, in reading the smallest print or in distinguishing objects at long distances without artificial aid, often surprise my younger folks. Others who lived more with the aborigines and were favoured with better opportunities of observing their peculiar habits than I ever had, have, I regret to say, done little or next to nothing to preserve the memorials of a now almost forgotten race. If I have succeeded in preserving anything of value respecting that race and its language, it has been due to a cast of mind which could not see an unusual, however trivial an event, without making a mental note of it, and also, to me, the utter impossibility of forgetting facts and incidents. Instead of presenting these facts in a hard, dry, and scholastic form, I have, in consideration of the interest of the general reader, and to make the matter more attractive, used a style a little more racy than the dignity of the subject might otherwise allow, and I have introduced matter not exactly pertinent at all times to the subject discussed. My good intention must be my excuse.

Let the reader imagine himself leaving Adelaide from the east end of Rundle Street, the Park lands unfenced, his course is south-easterly to Prescot's Section, thence due east, having Kent Town, Norwood, and Kensington on his left hand, and Marryattville on his right; the last house he passes is one which was occupied in 1847 by Colonel Freeling; still keeping east, Mr. Shipster's Section on the left and Surveyor Perry's on the right. As thirty long years have passed away since I saw this locality, things may so have changed as to render identification next to impossible. A few hundred yards in from the corner of Shipster's land, and where the old volunteers used to drill under Sergeant Gome, in the presence of hawke-eyed Major Moore, there was a clear space of a few acres backed by noble gum trees. Young gums and wattles, not as high as the fence, began to spread themselves over Perry's land. On the particular occasion now under consideration (I think the date was 1848), by special

invitation of members of a large tribe of aboriginals, we met to witness the first and largest corroboree that ever I saw. It was an entertainment in honour of the new moon, and was both comprehensive and imposing; it was a serio-comico-ludicro play in four acts, intended to pourtray the leading events in human life. It embraced a representation of the amusing games of childhood, the seriousness and absurdities often seen in courtship, the excitements of hunting, and the fiery passions of a fierce tribal conflict. Unlike the plays of civilization death was not mimicked,—that was with them no subject for jest nor even for serious conversation, it was for the contemplation of the mind in mournful silence. The whole affair was highly instructive, and was kept up with interest from shortly after dark until near midnight. Thirty years after I saw another away far north of Adelaide. It was specially got up at Christmas time, but oh! what a contrast, "what a falling-off was here." The terrible scourge of both white man and black, drink, had done its deadly work, and the drunken remnants of a broken and non-propagating tribe, vainly attempted to perform, with European adornments and European tinware, a villainous compound of savage and civilized rant and drivel—a hideous insult to their brave old forefathers' names and memories; and all for what?—the hat was passed round for cash to purchase more drink, and they got it.

Continuing our course still eastward from where we saw the first grand corroboree, we pass on our left the house then occupied by an old and respected identity, Mr. Nathaniel Hales, and on our right land held by another identity equally well known and loved for his large-hearted benevolence, Mr. Dean, a London brewer. Still continuing the same course we reach a small creek just before the road turns off to the right. This portion of Mr. Dean's land was unfenced and covered with magnificent wattle trees. Mr. Hales' land was also open here, but almost bare of undergrowth. On the north side of this road, only a few chains distant, and on the north-east bank of this water-course, is the western boundary of an ancient native burying-ground, covering possibly an acre of land; it was one of the oldest and the most sacred burying-grounds of the Adelaide tribe, the Westminster Abbey of the aborigines; it was sacred to the last rest of aboriginal royalty, and the most distinguished men and women of the tribe. The queen had died away down by the Torrens, and some distance north-east from where St. Peter's College now stands, I do not know the distance from thence to the burying-ground, but I should think it to be at least four miles. Devoted men of the tribe—not attended by the women—carried the remains of their queen, on a sort of litter, all that distance to her grave. The grave was dug by a few men, who used their

spears and hands to remove the earth. Messengers, seemingly weighed down with grief, often went to and fro between the grave-diggers and the slowly approaching funeral procession. When the grave was ready we saw the party coming by way of the north-east corner of Shipster's open land, and passing to the south of Mr. Sandford's; they became curiously erratic in their movements, zigzaging away towards Mr. Hale's house, wheeling and turning, but always getting nearer the place of burial. Master Fred Hales and I were playing together at the time in the vicinity, and our curiosity being aroused by the strange sight, we had a most favourable opportunity of witnessing the evolutions. On they came, and away they went, mad-like in their movements but with method in that madness. Crossing over into the wattles on Mr. Dean's land, they halted for a moment, started again, walked backwards, sideways, forward, around one tree, backward, around another, sideways, around a third. Suddenly starting off at a run, but like trained soldiers keeping perfect step, darting off at a right angle, backing down the hypothenuse, endeavouring in the most methodical manner possible to produce the greatest possible confusion, keeping up all the time a mournful chant which could be compared to nothing so well as to the partly muffled sounds of distant Æolian harps or a passing swarm of bees. After about half-an-hour of this, they started off at a run in the direction of Magill, crossed the little creek, skirted the eastern end of the burying-ground, suddenly retracing their steps, then turning right-about and walking for a short distance, wheeling a little to the right they marched straight to the open grave. After a short pause—not a word was spoken by any—a few pieces of bark and some leaves were placed on the bottom of the grave; the body was then gently lowered, leaves and bark were placed gently on it, and then the grave was filled with earth. With bark and boughs they built a little wurley over the newly-made grave, with its open side towards the east. The mourners camped that night not far distant. Next morning the eastern sun spread his golden glory down the western undulations of those hills. The watchers saw the light kiss the newly-made grave of their beloved queen, and, to them, it was a sign that she had reached the land of light and of the rising sun. I learnt afterwards that the object of their peculiar and eccentric journeyings was to puzzle the evil one, and so prevent him from following their footsteps and catching the queen, before she had time to reach the eastern and sunny land of the good.—Certainly a very practical means of escape from the devil.

I will now briefly refer to their language, and furnish a short list of the words and phrases of those tribes who once inhabited the plains of Adelaide. The list is very brief and of course

incomplete. The language possessed great flexibility, and was capable of a varied expression. Although its structure was not wanting in art, yet it seemed to be lacking in poetry. There was never anything in their conversation, even remotely, like what was common among the Red Indians of America or the inhabitants of New Zealand. It is difficult to give the exact pronounciation of the words. The accent often changed according to the meaning or earnestness of the speaker, much in the same way as "oratorical" words are treated by the elocutionist. It was, like French, a language that could not be mastered without a living teacher's aid and example. By means of the list which I have arranged hereunder, I have made myself understood by those who could not possibly have had any intercourse with the Adelaide tribes; the difference in dialect not being so marked as that between the Cornish and that of East Devon. The language was very sonorous, being rich in vowels, and when two natives were having what might be termed a pleasant chat at the camp fire, their voices were extremely agreeable, and if the listener did not understand a word, there was a melody in the tones which did not soon tire. There were some sounds that the natives could not articulate. It was truly laughable to witness the attempts of an aboriginal to pronounce "split sixpence." I never knew one who could do it no matter how great the reward promised. With regard to the pronounciation of native names, I regret to know that the present generation has, in several instances, departed from the original mode. I will only take one—Booyoolee—for example It was always pronounced as here written, crisply, as a word of three syllables, with the accent on the first. It had real music in it then, but of late years it has been altered to Bowley, and actually printed on the State School maps of the Colony as Boley ! Let any one look at the words thus and say which is best. It looks to my mind like Darwin's scheme inverted.

Bōō-yul-lee (pronunciation). Booyoolee. Bowley. Boley.

In the spelling of native words the early settlers, surveyors, and government officials, in nearly all cases, deserve great praise for the success which generally attended their efforts to represent, by letters, the spoken language of the aboriginal races of Australia. I have done my best to spell the words so as to convey to the minds of others those sounds which, after the lapse of many years, my memory recalls with so vivid a distinctness, that for a time I again live over the scenes and circumstances of my early life. As a general rule, the names of places in the warmer parts of the Colony, which have a like ending of say "owie" for example, mean water in the form of creek, spring, or native well; whereas in the more southern districts the ending syllable rather indicates

hunting and camping grounds. When words are repeated as in "Burra Burra," "Para Para," a comparative meaning is attached to the name, and it becames Great Burra or Great Para, although in the latter case the Europeans have made the distinction in the Gawler district thus:—Para Para and Little Para.

In conclusion, I express the hope that young Australia, instead of reproducing the names of all the counties, towns, hamlets, mountains, lakes, and rivers of Europe and Asia, will preserve the names which the aborigines of Australia gave to the distinctive features of their ancient home.

As a general rule for pronunciation make as many syllables as possible and be careful to sound the last vowel clearly, but not necessarily to accentuate it.

Animals, Birds, &c.

Bitcha, *locust, grasshopper*
Cōndollee, *whale*
Cōorakee, *cockatoo*
Coorāka, *magpie*
Cooyar, *fish*
Connādna, *wallaby* (female)
Cooyōunda, *unclean animals*
Cudlee, *dog*
Currēe, *emu*
Coolyow, *white kangaroo*
Cōngoola, *crawfish*
Curkinya, *sparrow hawk*
Curca, *a small fish, bream*
Mayōo, *cat*
Malōota, *ring-tail opossum*
Mootanitchee, *fowls*
Mootanitchee-wangarnee, *cock-crowing*
Mootanitchee wacwacoo, *chickens*
Moonbi, *pigeon*
Mareela, *mullet*
Nanta or nanto, *horse*
Nantootercа, *male kangaroo*
Nerpa, *rat*
Nercoondar, *shark*
Pilta, *brush opossum*
Pilyabilya, *butterfly*
Pitta, *goose*
Percoo, *mouse*
Taboora, *blue-fly*
Tapoo or Taboo, *small black fly*
Toonda, *red kangaroo*
Toorca, *grey kangaroo*
Toonoo, *snake*
Tinjella, *quail*
Taboōrāparee, *maggot*
Wadla, *wallaby*
Wadla watpa, *wallaby rug*
Walta, *large bird, turkey, eagle, &c.*
Wangoo, *black opossum*

Actions &c.

Adleēn, *to burn*
Adleecōo, *for each or both*
Arcoōnee, *to eat*
Arcoōndee, *to drink*
Bōora bōora, *by and by*
Boōcmarnēe, *to peel or pare*
Bōokēenee, *to cut*
Boocārnee, *to swim*
Cōoēe, *come*
Coombānee, *to cook, roast, &c.*
Cōndanēe, *to fight*
Cangārnee, *shall I go on or may I go*
Carōotche, *to sneeze*
Cōombandee, *gone*
Cōorandee, *near you*
Coree, *A Gawler Corrobora*
Corrōbora or Corroboree, *a native concert*
Coorānta, *very near*
Coongārnee, *bring it*

Caānyanee, *to bake*
Caānyanee terca, *bake a kangaroo*
Coombānee currēe, *cook an emu*
Eūyanēe, *to stay, keep still*
Eudoāndee, *push*
Hōoranee, *throw*
Hōonanīncootoūrn, *what's the row about*

Itchyānga, *a little distance*
Mānghee, *to laugh*
Mallēetra, *never mind*
Medōo, *sleep*
Mōocarndēe, *to cry*
Meteen, *to steal*
Minca, *sore*
Mīncacōocōo or minca minca, *very sore*
Mittarēeneuetēen, *to catch a [thief*
Mōocarn, *to dance*
Mōolareen, *concealment*
Mōolana, *no*
Mōondetercōmee, *I have asked*
Moommoōndee, *pick it up*
Moōrlanawāranacōon, *I don't understand*
Moontawāngarn, *no good—false*
Moontoo, *not hungry*
Moontootoūata, *thorough feast*
Moonya, *cold*
Moōnyarēenee, *very cold*
Mōorhaneē, *to pour out*
Moonee, *very good*
Myimbawa, *where is the food*
Mootameltchanee, *to smell*
Moōntawyarndee, *accouchment*
Mooreindee, *sailing along*
Mitterootee, *don't steal*
Mīncabōokenee, *tattooing*
Nalta, *quick*
Nincoo, *you*
Noodlootee, *when*
Noōnyoorōo, *wet*
Natta padneādloo, *let us go*
Ootpandee, *to put on [quickly*
Ootpāndee nīncootāndoo, *put it in you net*

Oritchīnga, *enough*
Oodloonalaineenee, *where are you going*
Oodonee, *not well*
Oodlootindoo, *how long*
Oona, *what?*
Ooringar, *to hear*
Ooncoo, *who is it for*

Pādmenēe, *jump*
Padnee padnee, *to run fast*
Paloonee, *dead*
Paloondee, *thirsty*
Panīnga, *some time ago*
Panīngola, *to-morrow*
Para, *river or creek*
Para para, *large river*
Pandeepaninga, *to go away*
Paroo, *flesh*
Patteēnoo, *to push down or hit*
Peedanee, *to swim strongly*
Pīngaree, *turn round*
Pōngareen, *to fight*
Poorōona, *alive*
Pootāndee, *ready to eat*
Pōotertee, *cooked*
Pōoltanee, *to throw*
Pōoltoorōo, *dry*
Pōomanee, *to spear*
Pōondoonee, *to blow*
Pihareenee, *to look*
Padnootcha, *it is his*
Pēerewērkenee, *fishing*
Tateen, *to climb*
Tauata, *fine*
Teatte, *yes*
Teecaruee, *sit down*
Tercoonee, *to ask*
Terpoonee, *to kiss*
Titchou, *hungry*
Tookeraar, *ever*
Tyeenwurlie, *to build a hut*
Tatoonee, *to kick*
Tidnatitapin, *tie by the leg*
Titapin, *to tie*
Toodlee, *boiling like surf-foaming*
Tooltandee, *afraid*

Touata, *plenty*, the same as *fine* &c., *nearly*
Witou, *me*
Wacareen, *drunk*
Wakina, *no good*
Wandandee, *to put away*

Time, Number &c.

Booker, *old*
Coodnootcha, *third male child*
Cōomandee, *one*
Coomar, *another*
Eurertcha, *second male child*
Ichertamaroo, *first male child*
Kertānya, *first daughter*
Meelarta, *fourth daughter*
Meelitcha, *fifth son*
Moonarta, *third daughter*
Moonitcha, *fourth son*
Oritchee, *five or plenty* (no counting above *five*)
Pappa (*under age*) *boy under 21 years*
Pooleearta, *second daughter*
Pōleechee, *two*
Pooleecheecooma, *three*
Poleechee poletchee, *four*

Things Various.

Baloureendee, *cloudy*
Balouna, *black*
Barcar, *the bark of trees*
Barcayoocoo, *canoe*
Booca, *a pustule or pimple*
Boorcana, *white*
Cackera, *moon*
Coco, *sore, wound*
Cooroo, *pot*
Cooyapeeree, *fish-hook*
Cooyanooree, *fishing line*
Cowee and nearly all words ending '*owe*,' '*oue*,' &o. *water*
Coorla, *fire*
Coorndoo, *thunder*
Coondoolee, *perspiration*
Coodillar, *winter*
Epittee, *orphan*
Hooyer, *small pox*
Hooltinger, *night*
Hoongeter, *mother* (animal)
Hoonkee, *female*
Hootawerta, *chin*
Iera, *white of egg*
Iicharee, *friend*
Marcoo, *clouds*
Meedla, *spear thrower*
Meeninda, *yolk of an egg*
Meenoo, *wattle*
Meeree, *thunderbolt*
Minpee, *fint, hard*
Mooca, *egg*
Moocoota, *hills, mountains*
Moodloolar, *grandfather*
Mookee, *crystal*
Mookeeooroo, *glass bottle*
Moolta, *beard &c.*
Mooloota, *nose-stick*
Moolootacurla, *dry stick*
Mooncara, *girl*
Moona, *cross cut saw*
Moonacoultoo, *hand saw*
Mootcherta, *rug*
Murtpoona, *murderer*
Myee, *biscuit*
Oombeener, *widower*
Pandabaar, *gun*
Peenoo, *charcoal*
Penna, *red hot*
Pendee, *hole in the ground*
Pietchootee, *blind*
Piltitlee, *scissors*
Pindaparee, *rice*
Pindetōodtameau, *soldiers, police*
Pindinga yerta, *another country*, unga and inga terminals for *land, district*, &c.
Pingareene, *lightning*

Pinyatta, *sugar*
Pooree, *stone*
Pooyoo or Poyow, *tobacco*
Pyetchabooltee, *old woman*
Purleu, *hair*, *feathers*
Purnappee, *mushroom*
Taminga, *white gum*
Tandee, *tucker bag*
Tapa, *road or path*
Tappoo, *small fly*
Tchiar, *spear*
Teralya, *timber*
Tindoo, *sun*
Tingue, *leaves*
Tinguwattoo. *boughs*
Tinguwurlie, *a little bough hut or mimi*
Tinyara, *boy*
Tooca, *clay*
Toolta, *sister-in-law*
Tooltee, *quill*
Toonyar, *widow*
Toora, *waistband for females*
Tooranacarootee, *a looking glass*
Tooroo, *watershed of a range*
Toorootoon, *brother-in-law*
Tootoondoo, *right hand side*
Turtcha, *egg-shell*
Ummeeyamayaroo, *milk*
Walteela, *fine, calm, peaceful*

Parts of the Human Body.

Caltoo, *heart*
Coodoo, *breast*
Coondee, *thigh*
Coora, *large blue gum*
Euree, *ear*
Hootawerta, *chin*
Meedla, *nose*
Meena, *eyes*
Mepootee, *eye-lash*
Miltee, *hip*
Milteewerpoo, *hip bones*
Mindawerta, *navel*
Mooca mooca, *brains*
Mooltawerta, *cheeks*
Moonawertowerpoo, *neck-bone*
Moora, *hand*
Moorlanee, *dead and buried*
Moota, *knee*
Omitcha, *wife*, but generally "Lubra."
Peeco, *eyebrow*
Peetee, *bowels*
Poorndoolawerpoo, *back-bone*
Terlanya, *tongue*
Terpoonree, *to kiss*
Tiapa, *mouth*
Tidleecoonboo, *bladder*
Tidnapalta, *boot*
Tidnayerlie, *great toe*
Tidna, *foot*
Tininyawertpoo, *ribs*
Umme, *breasts* (female)
Werta werta, *privates*

The foregoing list may be regarded with some interest as containing the fragments of the language of a race of Australian aborigines which has absolutely died out. It may even be useful to some curious minds who may take pleasure in the study of aboriginal philology. I have limited the record of my observations and experience to a moderately well defined locality, believing that the object which the Royal Society of New South Wales has in view would be better served thus than if my descriptions covered a larger area, and consequently included scenes and anecdotes of savage life of which I might not have been an eye-witness. This effort, though feeble in itself, yet, if joined to the efforts of many others, in different parts of the great Australian continent, may

produce, in the aggregate, a source of amusement and instruction for the next and future generations.

Discussion.

Mr. J. F. Mann—Said that what he had just heard read agreed very well with what he had observed of the customs and manners of the aboriginals of Australia. He would like to point out one of the reasons why the blacks objected to eat the flesh of snakes which they had not themselves killed, or which had been deprived of life by the whites. It was well-known among bushmen that when a snake was driven into a corner, and it saw no way of escaping from its captors, it would turn round and bite itself. This fact was also known among the blacks, and they would refuse to eat any portion of a snake that had met death in that manner; when they killed a snake they knew whether it had previously bitten itself or not, but when the reptile had been killed by a white man they were inclined to believe that it had contributed to its death by having inserted its fangs into its own body ere life became extinct. Hence the establishment or origin of the prejudice. He had however known instances when this prejudice was overcome, but the blacks first assured themselves that the reptile had been incapacitated from inflicting injury to itself, through its captor severing the head from the body. With regard to the habit of science among the aboriginals of producing fire by the agency of a couple of pieces of wood, a deal of controversy had been raised but no satisfactory solution of the native art had yet been arrived at. In producing fire two pieces of timber were always used. One of these pieces, having a small hole in it, was laid down horizontally while the point of the second piece was inserted in the small opening in the other piece. The two sticks were thus fixed at right angles, and the natives taking the vertical piece between the palms of their hands would work it rapidly backwards and forwards, thus causing a certain amount of friction that ultimately gave the result they desired. The place of contact or frictional point of the two sticks was always carefully surrounded by a quantity of light charcoal or other inflammable stuff that immediately a spark was emitted would instantly catch the flash and generate a flame. With reference to their habits of eating to excess, he had witnessed some amusing sights. An apparently favourite custom among them was that when a native had eaten more than enough, he would betake himself to the nearest log, across which he would lie stomach downwards, and sometimes sway himself gently to and fro. This position although seemingly an awkward one, appeared to be fraught with ease and relief to the native.

Mr. P. N. Trebeck—Referred to what Mr. Stephens had written about the fighting laws of the blacks, and he related a martial custom that was prevalent among the tribes. When a blackfellow killed an enemy, the first thing he did was to open and dissect the dead body, procure the kidney fat, and afterwards smear himself from head to foot with the greasy and inodorous substance. The voracity of the people for food was on one occasion very clearly exemplified to him. A number of blacks had encamped upon the edge of a swamp, in the mud of which a great multitude of eels were seen. The natives made a surfeit on the eels, and afterwards began to cry for no other reason than because they could eat no more.

The Hon. L. F. De Salis—Drew attention to the universal prejudice that the aboriginals had to pork. The tribes in the far north could have had no intercourse with those of South Australia, yet their dislike to the flesh of swine appeared to be identical.

NEW SOUTH WALES AS A HEALTH RESORT IN PHTHISIS PULMONALIS.

By Bernard James Newmarch, M.R.C.S. Eng., L.R.C.P. Lond.

[*Read before the Medical Section of the Royal Society of N.S.W., July 19, 1889.*]

At our last meeting our worthy President deplored the scanty contribution of papers to be read before this Society, and at the suggestion of Dr. Knaggs devoted this evening to a discussion on the Climate of this country in the treatment of Phthisis. I was asked by him to open this discussion, but after I had acceded to his request I bitterly repented, for I feel I have no right to do so, my experience of the climate of this country and the treatment of the disease in question being very slight indeed, compared with that of others in this room. Still when asked I did not care to refuse, and you will pardon me if the matter is brought before you in a crude and imperfect manner, it cannot however diminish the value of the discussion; we hope to reap the benefit of the experience of all, whether that be little or great, and inasmuch as I have presumed to open the discussion, it is hoped that those of little experience like myself will help in it.

I think most of you here present will agree with me that the preconceived ideas of this climate, by which I mean the ideas of this

climate as formed at home are to say the least of it, extraordinary; and when one looks back on the picture, as fancy painted it at home, both of climate and country, and then on the stern reality he is convinced that no picture can be truly painted, and that even the outline is imperfect and indistinct unless personal experience handle the brush; it is the value of this personal experience which is sought to night. When my memory recalls those I have heard told to go to Australia for the sake of their health, I often wonder if the same advice would have been given if the giver had had practical experience of the climate and country.

It is almost amusing to read the description of the climate of this country as set forth in various works and articles, descriptions more often than not, written by those who, at the most, have spent a few months in it. It would be amusing if the ghastly fact did not remain that these descriptions are too often the ground on which the advice to send a patient suffering from advanced phthisis to this country as a health resort is based. I have heard it stated as a fact that a certain well known writer described the country between Melbourne and Albury, the habits and mode of life of the inhabitants, and his impressions of the country districts of the colony of Victoria, simply from the knowledge gleaned by looking out of the railway carriage window on the two occasions on which he had to make the journey by overland express. I know for a fact that patients have been sent out here by advice based on knowledge gained from no better source.

It is with the idea that personal experience can alone guide us that I have restricted the discussion to the colony of New South Wales, to attempt to include the whole of Australia would be absurd. To deal with New South Wales alone seems a gigantic task, and to do so honestly and at the same time comprehensively is utterly out of my power. With the hope that I might gain some information which would be of value to you, I had a circular printed and sent to over 100 medical practitioners in New South Wales. I selected those practising at what are termed the health resorts of New South Wales, a list of which I procured from Bruck's "Australian Health Resorts." I am sorry to confess that I received very few answers, but I have tried my best to embody the views of those received in my remarks.

I have here (Table A.) a table of Meteorological Results of the most important health resorts in New South Wales, together with Rain Maps for the years 1884 and 1887 (1884 being one of the driest, 1887 one of the wettest years). The meteorological results are taken from information kindly supplied me by Mr. H. C. Russell, Government Astronomer.

Being a vast country, and one with peculiar geographical features, New South Wales abounds in climates of various kinds,

and there is little doubt that it possesses some admirably adapted to the treatment of certain forms of Phthisis. I thought at first, that it would be an easy matter to describe an ideal climate, and then see in what way our climates agreed or differed; this I found to be impossible, so much depending in the choice of one, on the different stages and varieties of Phthisis, so much on the individual constitution of the patient. The simplest idea that comes to one's mind is to choose a locality where the inhabitants do not suffer from Phthisis, such as the Andes; but as is so clearly pointed out by Dr. Williams in his work on Pulmonary Consumption, this is not a reliable ground to work on. I daresay there was a time when the deaths from Phthisis in this colony were few and very far between, and on looking over a list of districts in New South Wales, giving the number of deaths from all causes together with the number of deaths from Phthisis in 1887 in each district, which was prepared by Mr. Coghlan, Government Statistician, and kindly lent me by Dr. Pritchard Bassett of Bathurst, I had no difficulty in picking out numerous localities where the death rate from Phthisis was nil. (Table B.) Table C. is prepared from material kindly supplied me by Mr. E. Sager, whose courtesy I now gratefully acknowledge.

The deaths from Phthisis during 1887 numbered 977, and a remarkable fact remains that the number of deaths from Phthisis reported in 1887 is less than that for the three preceeding years, 1886 = 1,051, 1885 = 1,178, 1884 = 1,093. The reason for this diminished death rate may be due to the fact that the medical practitioner at home is more alive to the knowledge of the proper class of consumptive to send out here. It is to be hoped that this is the case, and I am inclined to think it is; for medical works lately written point out, more clearly than was previously done, the class of cases fit for climatic treatment, and the particular class of climate appropriate to each case.

At any rate, if we cannot advocate the immunity ground so far as our cities go, Dr. MacLaurin points out in his valuable paper (The Comparative views of the Mortality of the Different Colonies from Certain Diseases) that "the country districts do compare very favourably with most other countries in the globe." A little thought will make it plain to you that we must not rashly condemn any locality because immunity from death from a particular disease cannot be placed as a recommendation. All recent work on the subject points to the important question of the infective property of certain microbes, amongst them the *bacillus tuberculosis;* and I cannot help referring you to the remarks of Lander Brunton in the Croonian Lecture published in the British Medical Journal June 8th, 1889. In speaking on the hereditary property of disease he points out that two factors are necessary—the soil, and the

seed—"the soil is hereditary but the seed may not be sown in it." As an example, he quotes the very disease which we discuss to night. These remarks are wonderfully borne out in Dr. MacLaurin's paper, before referred to in which he points out the immunity of the Jewish population, simply from the care bestowed on the selection of food. In passing, I would mention a matter which has struck me—I have noticed the prevalent, but none the less dirty and abominable habit of expectoration practised here; (you have only to look at the pavements in Sydney to see what I mean) and thought of the numberless microbes which must be disseminated and breathed in the air of our streets solely through this habit.

Authorities divide, for purposes of classification, the different climates into groups—for instance, *Jaccond* divides climates into two fundamental groups, viz., high climates with slight, and climates of the valley with moderate atmospheric pressure.

Williams divides climates according to the combined characteristic meteorological and geographical elements.

Douglas Powell, after describing the different varieties of Phthisis to be treated at elevated climates, divides the rest of the climates under seasonal headings.

Any system of classification must break down, and in the end one comes to look on each individual case, and each individual case requires a particular climate according to its peculiar characteristics.

For purely systematic purposes we may divide the climates of New South Wales according to their geographical situations. A range of mountains runs parallel to the sea coast, this range forms the top of the elevated tableland upon which the Great Dividing Chain of mountains rises and from which the plains extend to the west. Thus we can divide the surface of New South Wales into —1. The Coast District. 2. The Table Lands. 3. The Plains. I propose to take each of these districts and shortly describe the summer and winter meteorological peculiarities, and see in what measure they are suitable in the treatment of Pulmonary Phthisis.

I. Coast Districts.

Summer—The heat and the moist enervating climate are almost proverbial. The temperature is variable day by day, and during the day. The extremes in Sydney may be pointed out. Max. 98·2, Min. 48·7 is an illustration of a record of twenty-four hours. North-easterly winds prevail, making the air damp. The rainfall is very variable, *e.g.*, in December 1887 the rainfall was 7·088 inches with 18 rainy days. I will only mention *the hot winds*, not as a peculiarity of these districts, but only because they are the summer accompaniment. I doubt if anyone would advise the

summer climate of the coast district of New South Wales as a therapeutic measure in the treatment of pulmonary consumption.

Winter—During some winters—winters in dry years—the coast climate leaves little to be desired; with a mean temperature of 56°, days warm and sunshiny, nights moderately cold, westerly winds prevailing, the meteorological results at any rate will compare favourably with many health resorts which are highly recommended; it is only right however to state that the variation in temperature, humidity and force of wind is very great. The district can be prescribed as a winter resort (I speak of winter here) in cases not suitable for treatment in rigorous climates, and in those cases not suitable for treatment in elevated localities; where in point of fact it is sought to prevent inflammatory complications, *e g*, laryngeal, bronchial, and pneumonic inflammation, or where the indications are as pointed out by *Jaccud* "local preservation with improvement of constitutional condition."

II. Table Lands.

This division holds a very important position, if in this colony we are to lay claim to the possession of climates which can compete with the health resorts on the continent of Europe *in the treatment of Consumption by High Altitude Climate* it is in this division alone that we must seek to find them; and if by *High Altitude Treatment* we mean that it is necessary to have an altitude equal to that considered requisite and available on the continent of Europe, viz., 6,000 to 7,000 feet above sea level, we can at once put the matter aside, more especially so if, as authorities state, it is essential in these latitudes that a still higher altitude is needful.

The altitude of our mountain resorts reaches the maximum of 4,600 feet at Kiandra, and the highest peak in our colony is Mt. Kosciusko 7,800 feet above sea level. It remains to be proved whether any enthusiast will establish a sanatorium near the summit of that mountain; but until that is done we have nothing which will satisfy the demands of the *High Altitude* advocates. Still, we have in this division a number of resorts with an elevation of 4,600 to 1,543 feet above sea level, resorts which will in time be of inestimable value to us.

The *Summer* in these mountain districts is hot by day and moderately cool by night, the temperature is very variable, and I have experienced bitterly cold windy days in summer; the rainfall is moderate as a rule during the summer months, too moderate perhaps where, as is too often the case, one is obliged to personally store the water required for consumption and use. Hot dusty winds are not uncommon. The climate may be described as bracing and stimulating.

The *Winter* is rigorous, and from personal experience I can assure you that it will compete with any climate I know; the temperature

is very variable, fairly warm one day, it may be bitterly cold the next. The rainfall is often excessive, and day after day may pass with one continuous downpour, till one wonders indeed why we ever drew comparison with any British climate. These mountain climates can be recommended for all cases of incipient Phthisis, more particularly in summer ; and if I were asked which was the best all the year round division I should, in spite of the cold winter, choose this. In chronic pneumonic, and hæmorrhagic phthisis these climates are the best we have ; and even in advanced cases, provided there is a fair proportion of sound, or comparatively sound lung I would not hesitate to suggest these climates as the most preferable in summer.

The winter climate of these mountain districts is by no means contra-indicated in incipient Phthisis ; but I would not advise it in any case liable to inflammatory complication. The degree of altitude in these various localities will decide the question, for or against, in nervous, so called erethric cases, or in those complicated with heart disease, emphysema of the lungs, diseases of the liver and kidneys ; and the same question will arise in cases complicated with laryngeal trouble. I can confidently recommend the mountain climates in cases suffering from bowel complication.

III. The Plains.

In summer or winter possess a climate almost unique, it is a dry hot stimulating climate. The winter is characterised by beautiful warm sunshiny days and cold nights. The rainfall varies year by year, but the evaporation is so great that the climate is dry. Cases of Phthisis that benefit by dry hot climates, *e.g.*, Egypt, Cape of Good Hope &c., will do as well, if not better in the Australian Plains, such cases are those with emphysema, bronchiectasis and large secreting cavities. In dealing with the mortality from Phthisis in this country it would have been valuable information if it had been possible to place before you the number of cases of Phthisis imported as contrasted with those native born. It is a general impression that native born consumptives are as short lived as any others. In my own practice during the past six years I have notes of 33 cases of Phthisis, of these 18 were born at home, and 12 came out for climatic treatment, of these 8 have died ; none were very far advanced cases and in all death was caused by acute inflammatory complications. The 6 other cases born at home developed Phthisis after arrival, all having marked predisposition, hereditary and otherwise, of these 3 have died very quickly after developing symptoms ; the remaining 7 cases are doing well. Of the native born cases, 15 in number, 11 ended fatally within eighteen months of the development of symptoms. The dread evil, to my mind, is any inflammatory complication ;

only let these cases remain without that arising and they may live for years—this opens up the question of the prevalence of other lung diseases besides Phthisis, and their influence on the mortality of Phthisis.

I fear, gentlemen, I have detained you far beyond the limits of patience, and I thank you for the patient hearing you have given me. I did not think it right to put forward any bold views which I may have on the subject, and I have tried to place the matter before you in an impartial manner, but I cannot end this paper without stating that I feel sure that a more careful selection of cases fit for climatic treatment in this country is very needful: many important factors, social as well as climatic are, or should be, considered. As a rule it is not the rich and well-to-do consumptive, one who can pick and choose his locality in search of health, that is sent out here, more often it is the middle class or poor one that is told he can find a healthful climate and occupation in Australia, it is perfectly true he can find both; but too often in the search for one he loses the other, and in the search for both he loses his life or gives up the chase to return home a sadder and wiser invalid.

TABLE A.—Meteorological Reports of Health Resorts in New South Wales.

Name.	Distance from Coast, Miles.	Altitude.	Mean Summer Temperature	Mean Winter Temperature	Ext. Maxim.	Ext. Minim.	Average Rainfall, Inches.	Number of Rainy Days.	Prevailing Wind.
Albury	175	572	70·7	53·5	108·8	28·5	27·66	86	W.
Armidale ...	81	3278	67·9	52·2	93·6	32	33·41	91	E.
Bathurst... ...	96	2200	66·5	49	99·9	23	24·49	79	S.W.
Bourke	386	456	78·6	62·2	118·9	35·5	16·45	41	S.E.
Bowral	26	2171	62·3	47·7	90·5	25	33·16	114	W.
Crookwell ...	76	...	62·7	46	97·8	22·1	33·25	108	N.W.
Dubbo	182	865	71·9	53·8	106·9	22·7	21·41	59	E.
Eden	...	107	65·9	54·8	91	38·1	35·98	117	S.W.
Glen Innes ...	90	3518	68·7	50·6	102·3	26·1	34·32	100	E.
Goulburn ...	54	2129	65·6	48·6	107·1	19·6	26·49	84	N.W.
Hay	302	305	71	54·7	112·5	29·1	14·11	53	S.
Katoomba ...	58	...	59·4	45	86	31	29·59	121	N.N.W.
Kurrajong ...	35	1270	59·1	47·3	82·5	29·5	51·04	113	W.
Kiandra	88	4640	51·5	38	88·3	8·6	62·40	106	N.W.
Moss Vale ...	31	2205	64·2	49·3	94·4	28·2	40·81	114	W.
Mount Victoria ...	61	3490	63·5	46·9	96·1	28·2	36·31	94	W.
Murrurundi ...	94	1543	69·5	53·8	92·5	31·9	32·58	67	N.W.
Orange	124	2891	62·7	45·1	92·5	24·3	37·53	105	N.E.
Picton	21	549	67·3	52·5	99·3	25·5	27·21	100	W.
Port Macquarie...	...	49	70	58·8	88	33·6	62·48	127	S.W.
Scone	78	680	72·5	54·4	101·4	33·3	22·76	53	
Singleton ...	40	135	73	56	103·2	38·9	27·91	92	
Wollongong ...	...	67	70	59·2	98·4	38·7	39·96	76	S.W.
Sydney	5	155	69	56·8	98·2	38·9	49·85	150	N.E.

TABLE B.

DISTRICTS.	Deaths from all causes exclusive of Phthisis.	DISTRICTS.	Deaths from all causes exclusive of Phthisis.
North Eastern—		*East Midland—*	
Tweed River	13	Waratah	4
Ulmarra	15	Adamstown	24
Bellinger	72	Glebeland	19
Port Macquarie	33	Wollombi	10
Copeland	6	Millfield	12
Dungog	27	Wiseman's Ferry ...	5
Greta	36	St. Albans	5
North Midland—		Prospect	2
Scone	28	*South Midland—*	
Drake	10	Bombala	31
Walcha	28	Argyle	70
Dundarra	6	Taralga	10
		Gunning	27
North Western—		Bungendore	16
Manilla	11	Barmedman	1
Quirindi	22	Murrumburrah	27
Nundle	11	*South Eastern—*	
Warialda	25	Woonona	135
Bingara	14	Robertson	11
Cassilis	4	Shoalhaven	51
Nyngan	31	Milton	33
Coonabaraban	25	*South Western—*	
Coonamble	40	Jerilderie...	13
Condobolin	14	Lyttleton...	1
		Mossgiel	3
West Midland—		Barringun	4
Blaney	66	Broken Hill	24
Oberon	15	Milparinka	9
Tambaroora	4	Loftus	35
Hill End	12	Cobar	28

TABLE C.

DISTRICT.	Population, 1881.	Deaths from all causes.	Deaths from Phthisis.	Percentage of deaths from Phthisis to deaths from all causes.	Percentage of deaths from Phthisis to Population
North Eastern ...	78,122	1,055	51	4·83	·06
North Midland ...	34,163	427	10	2·34	·02
North Western ...	52,077	765	27	3·52	·05
Metropolitan ...	242,583	5,546	513	9·24	·21
East Midland ...	89,854	2,089	199	9·52	·22
West Midland ...	65,566	845	53	6·27	·08
South Midland ...	99,169	1,236	56	4·53	·05
South Eastern ...	32,821	608	23	3·76	·07
South Western ...	49,709	877	45	5·13	·09

MONDAY, JUNE 24, 1889.

A Lecture was delivered to the members of the Royal Society of New South Wales at the Society's House, at 8 p.m., by Prof. Threlfall, M.A., Cantab. Subject: "The present state of applied Electrical Science.

The Chair was occupied by Professor LIVERSIDGE, M.A., F.R.S., President.

There was a large attendance, upwards of one hundred persons being present, including several ladies and visitors.

The lecture was illustrated by apparatus and diagrams.

On the motion of Mr. H. C. Russell, seconded by Mr. C. W. Darley, the thanks of the Society were accorded to Professor Threlfall for his valuable and interesting lecture.

WEDNESDAY, OCTOBER 16, 1889.

A Lecture was delivered to the members of the Royal Society of N.S.W., at the Society's House at 8 p.m., by W. M. Hamlet, F.I.C., F.C.S., Government Analyst. Subject:—"The Evolution of the Kerosene Lamp." Syllabus: Introduction.—Something historical about Lamps in general. Oils used for burning in Lamps. Short sketch of the History, Chemistry and Manufacture of Kerosene. Development of the Mineral-oil Lamp. The parts of the Lamp. Essentials:—1. The oil-vessel or fount. 2. The Burner. 3. The Wick. 4. The Air-draught. Assessories:—Globes, Shades, Stands, Suspenders, Lace and Paper Ornaments. The safety or the dangers attending the use of such Lamps. Accidents, Fires, Explosions. The Kerosene Act and Oil-testing. The economy of the Lamp. Domestic lighting. Illuminating a Church or a Hall. A Student's Lamp. The Midnight Oil. The Ideal Lamp. How to manage a Kerosene Lamp.

The Chair was occupied by Professor LIVERSIDGE, M.A., F.R.S., President.

There was a fair attendance, including several ladies.

The lecturer dealt with his subject in great detail. Commencing with the earliest times in the world's history, when the first known means of lighting was the torch cut from the pitch-pine, he traced the changes to the rope dipped in tar, used by the "link" boys of a century ago. Lamps of burning oil were introduced, he said, by the Romans, who probably received the idea from the Egyptians and Phœnicians. This most ancient

lamp was used by the Latin races to-day. Illustrations were afforded of these classic lamps in contrast with the lamp still used by the Esquimaux, and with those improved lamps of to-day whose illuminating power is fifty times greater. Little alteration in form was made in the middle ages. In the 17th century minor alterations were introduced, but at its best the lamp for centuries consisted only of an oil vessel with a rush wick, or a piece of fibrous bark and a strand of hempen yarn. From 1786, the age of revolution, the real development of the modern lamp dated. Reference was made to the Argand light, the French mechanical lamps, and the "moderator" lamp. The changes necessary to suit lamps for the burning of mineral instead of animal or vegetable oils were next mentioned. In 1852 the first known form of the kerosene lamp was invented in Germany, and its leading features were retained in the lamps of to-day. The succeeding stage of the lecture dealt with the various forms of oils—sperm, whale, colza, petroleum, &c., and their different qualities, the discovery of liquid kerosene and of kerosene shale, both in America and New South Wales. The preparation of the oil from shale as carried on in this colony was described; first the destructive distillation of the shale, and afterwards the fractional distillation of the crude oil. The evolution of the kerosene lamps was made plain to the audience by means of a number of illustrations and examples, showing each progressive stage of improvement. The essential features of modern lamps—the oil-vessel or fount, the burner, the wick, the air draught—were commented upon, as also were the non-essentials or accessories—globes, shades, stands, suspenders, lace and paper ornaments—each feature being discussed and the advantages of different types being pointed out.

The lecturer then recommended the observance of the following regulations as to the construction and management of all kerosene lamps :—

1. That portion of the wick which is in the oil-reservoir should be enclosed in a tube of thin sheet metal, open at the bottom, or in a cylinder of fine gauze, such as is used in miners' safety lamps (28 meshes to the inch).

2. The oil-fount or reservoir should be of metal rather than of china or glass.

3. Every lamp should have a proper extinguishing apparatus, and ought never to be blown into in order to put it out. Or it should go out of itself upon turning the wick down, as in the Defries or Harvey lamps.

4. Every lamp (intended for standing) should have a broad and heavy base.

5. Wicks should be soft and well dried before a fire before being inserted into the lamp. They should be of such a size to fill the wick-space completely without having to be squeezed in, and when first put in should be soaked with the oil.

Management :—1. The reservoir must be filled with oil every time before using the lamp.

2. On lighting, the wick should be turned low, and then gradually turned up after putting the chimney on.

3. Common flat wick lamps that have no extinguishers should be put out as follows :—Turn down the wick until only a small flickering flame is to be seen, then blow a sharp puff of breath ACROSS the top of the chimney, but never DOWN it. In many of the modern lamps it is merely necessary to turn down the wick and the lamp may be left to go out of itself.

4. Cans or bottles used for oil should be kept free from water and dust, and must be kept closed.

5. All lamps should be trimmed during the daylight, preferably in the early morning.

In conclusion, Mr. Hamlet spoke upon the safety or the dangers attending the use of the lamps referred to, and upon accidents, fires, and explosions. Allusion was made to the Kerosene Act and to oil testing, and to the economy of the kerosene lamp.

A vote of thanks to the lecturer for his interesting dissertation closed the proceedings.

WEDNESDAY, NOVEMBER 6, 1889.

Prof. LIVERSIDGE, M.A., F.R.S., President, in the Chair.

Twenty-one members were present.

The minutes of the last meeting were read and confirmed.

The certificates of three candidates were read for the third time, of one for the second time, and of one for the first time.

The following gentlemen were duly elected ordinary members of the Society :—

Berney, George Augustus ; Sydney.
Campbell, G. S. ; Sydney.
Farr, J. J., J.P. ; Marrickville.

The Chairman announced that the Clarke Memorial Lectures, arranged to be delivered on November the 13th, 20th, and 27th inst., had been unavoidably postponed until April or May next, on account of Mr. Wilkinson having been unable to prepare the lectures through absence from Sydney on Departmental business.

He also announced with regret the death of the Rev. J. E. Tenison-Woods, F.G.S., F.L.S., who had been an honorary member of this Society since 1875, and drew attention to an enlarged

portrait of that gentleman taken shortly before his death by Dr. Wright, and presented to the Society.

Dr. J. Ashburton Thompson read a paper on "Aids to the Sanitation of Unsewered Districts (Poudrette Factories)"

A discussion followed in which the following gentlemen took part:—Messrs. C. Moore, T. B. Trebeck, W. A. Dixon, F. B. Kyngdon, P. N. Trebeck, H. Deane, the Chairman, and the Author.

In the absence of the author, the Hon. Secretary (Mr. Kyngdon) read a paper by Mr. E. C. Manfred—"Notes on Goulburn Lime."

Mr. John C. H. Mingaye, F.G.S., read a paper—"Notes on some Minerals, &c." The following discussion took place:—

Dr. LEIBIUS—I would like to ask Mr. Mingaye with regard to the occurrence of this platinum in Broken Hill: Was it pure platinum—does it occur as pure platinum?

Mr. MINGAYE—No, it occurs as platinum with the other metals; I separated them. I worked up a large quantity of the ore.

Dr. LEIBIUS—And the analysis was done by dissolving?

Mr. MINGAYE—Yes.

Dr. LEIBIUS—I was asked whether it could be treated in bulk, and I replied that we had no appliances for so treating it. My enquirer wondered whether it could be treated like gold—that is by amalgamation. I had a communication the other day from Broken Hill. A gentleman told me there had been a great deal of discussion there, on the subject of the treatment of this platinum ore. It was said with regard to platinum it was used in the form of alloys, and was no use at all in its native state. Of course, it is simply impossible to think of treating the ore unless there is 50 or 60 per cent. of platinum, but the value Mr. Mingaye puts upon it I think is rather high.

Mr. MINGAYE—It is a great question whether platinum can be separated by concentration. It would not be two or three ounces to the ton.

The PRESIDENT—We are obliged to Mr. Mingaye for drawing attention to these matters, because no doubt if it can be found in anything like payable quantities it will be useful to this colony; but I agree with Mr. Dixon it must be found in a larger quantity, —because as far as I can recollect the value of crude platinum is not more than 10s. or 12s. an ounce in London,—that is before it can be treated. I am glad attention has been paid to the occurrence of these metals, because no doubt platinum is widely distributed, bnt usually in small quantities. It is a common thing to find it in limestone, and then there is this matter of the mineral water. Probably these waters will come in for medicinal

purposes. Then with regard to the tenerite bismuth, I would like to ask Mr. Mingaye whether he tested for gold?

Mr. Mingaye—I did not test it for gold but for silver.

The thanks of the Society were accorded to the various anthors for their valuable papers.

The following donations were laid upon the table and acknowledged:—

Donations Received during the Month of October, 1889.

(The Names of the Donors are in *Italics*.)

TRANSACTIONS, JOURNALS, REPORTS, &c.

Berlin—K. Preuss. Meteorologisches Institut. Ergebnisse der Meteorologischen Beobachtungen im Jahre, 1889.	*The Institute.*
Birmingham—Birmingham Philosophical Society. Proceedings, Vol. vi., Part i., Session 1887-88.	*The Society.*
Brisbane—Queensland Museum. Annual Report of the Trustees, 1889.	*The Trustees.*
Royal Society of Queensland. Proceedings, Vol. vi., Part v., 1889.	*The Society.*
Bristol—Bristol Naturalists' Society. Proceedings, New Series, Vol. vi., Part i., 1888-9. Annual Report for the year ending 30th April, 1889; List of Members &c.	,,
Calcutta—Geological Survey of India. Records, Vol. xxii., Part iii., 1889.	*The Director.*
Cambridge—Public Free Library. Thirty-fourth Annual Report, 1888-1889.	*The Trustees.*
Cambridge (Mass.)—Museum of Comparative Zoölogy at Harvard College. Bulletin, Vol. xvii., No. 4, July 1889.	,,
Cordoba—Academia Nacional de Ciencias. Boletin, Tomo xi., Entrega 3a Junio, 1888.	*The Academy.*
Dresden—Verein für Erdkunde. Jubiläumsschrift—Litteratur der Landes-und Volkskunde des Königreichs Sachsen. Bearbeitet von Paul Emil Richter, 1889.	*The Society.*
Edinburgh—Botanical Society. Transactions and Proceedings, Vol. xvii., Part ii., 1888.	,,
Royal Scottish Geographical Society. *The Scottish Geographical Magazine,*" Vol. v., Nos. 8 and 9, 1889.	,,
Florence—Società Africana d' Italia. Bullettino della Sezione Fiorentina, Vol. iv., Fase 5 and 6, 10 Sept., 1889.	,,
Hamburg—Deutsche Meteorologische Gesellschaft. *Meteorologische Zeitschrift*, September, 1889.	,,
Hobart—Royal Society of Tasmania. Papers and Proceedings for 1886, 1887, 1888. Report for the year 1888. Abstract of Proceedings, Sept. 9, 1889. Notes on the Discovery of a Ganoid Fish in the Knocklofty Sandstones, Hobart, by Messrs. R. M. Johnston and A. Morton, 1889.	,,

JENA — Medicinisch-Naturwissenschaftliche Gesellschaft. Jenaische Zeitschrift für Naturwissenschaft, Band XXIII., N.F., Band XVI., Heft 4, 1889. *The Society.*

LIÉGE—Société Geologique de Belgique. Annales, Tome XVI., Liv. 1 and 2, 1889. ,,

LONDON—Linnean Society. Journal, Botany, Vol. XXV., No. 171, July 27, 1889; Zoology, Vol. XX., No. 122, Aug. 31, 1889. ,,

Pharmaceutical Society of Great Britain. Journal and Transactions, Third Series, Vol. XX., Parts 229 and 230, July and August, 1889. ,,

Royal Colonial Institute. Proceedings, Vol. XX., 1888-9. *The Institute.*

Royal Geographical Society. Proceedings, New Monthly Series, Vol. XI., Nos. 8 and 9, 1889. *The Society.*

Royal United Service Institution. Journal, Vol. XXXIII., No. 149, 1889. *The Institution.*

LUBECK—Naturhistorisches Museum. Jahresbericht, für das Jahr 1888. *The Trustees.*

MANCHESTER—Manchester Geological Society. Transactions, Vol. XX., Parts i.-x., Session 1888-89. *The Society.*

MELBOURNE—Central Board of Health. Report of the Board for the years 1886-7, 1887-8, 1888-9. *The Board.*

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Mining Department. Mineral Statistics of Victoria for the year 1888. The Gold-Fields of Victoria, Reports of the Mining Registrars for the Quarters ended 31 March 1876 and 30 June, 1889.
The Hon. the Minister of Mines for Victoria.

MILAN—Società Italiana di Scienze Naturali. Atti, Vol. XXXI., Fasc 1—4, 1888-89. *The Society.*

MONTREAL—Natural History Society of Montreal. *The Canadian Record of Science*, Vol. III., No. 7, 1889. ,,

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NEWCASTLE-UPON-TYNE—North of England Institute of Mining and Mechanical Engineers. Transactions, Vol. XXXVIII., Part iii., 1889. *The Institute.*

NEW YORK—American Chemical Society. Journal, Vol. XI., No. 2, February, 1889. *The Society.*

PARIS—Académie des Sciences de l'Institut de France. Comptes Rendus, Tome CIX., Nos. 8–12, 19 Août —16 Sep. 1889. *The Academy.*

Feuille des Jeunes Naturalistes. Année XIX., No. 227, 1 Sept., 1889. Catalogue de la Bibliothèque, Fasc No. 6, Sept. 1889. *The Editor.*

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PHILADELPHIA—Franklin Institute. Journal, Vol. CXXVIII., No. 765, Sept., 1889. *The Institute.*

RIO DE JANEIRO—Imperial Observatorio. Revista, Anno IV., Nos. 7 and 8, July and August, 1889. *The Director.*

ROME—Accademia Pontificia de 'Nuovi Lincei. Atti, Anno XL., Sessione ia, iia, iiia, 19 Dec. 1886—6 Feb. 1887 (4to). Anno XLII., Sessione va, via, viia, 14 Aprl—16 June, 1889 (16mo.) *The Academy.*

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R. Comitato Geologico d' Italia. Bollettino, 2*a* Serie, Vol. X., Nos. 7 and 8, 1889. Relazione sul Servizio Minerario nel 1887. [8vo Firenze, 1889.] *The Committee.*

Società Geografica Italiana. Bollettino, Serie III., Vol. II., Fasc 8, 1889. *The Society.*

ST. ETIENNE—Société de l'Industrie Minérale. Comptes-Rendus Mensuels, No. 7, Juillet, 1889. ,,

SIENA—R. Accademia dei Fisiocritici di Siena. Atti, Serie IV., Vol. I., Fasc 6-7, 1889. *The Academy.*

SYDNEY—Mining Department. Annual Report for the year 1888. *The Hon. the Minister for Mines.*

Observatory. Results of Meteorological Observations made in New South Wales during 1887. *The Government Astronomer.*

VIENNA—Anthropologische Gesellschaft. Mittheilungen, Band XIX. Der neuen Folge, Band IX., Heft 3, 1889. *The Society.*

K. K. Geologische Reichsanstalt. Verhandlungen, Nos. 10, 11, 12, 1889. *"The Reichsanstalt."*

WASHINGTON—Bureau of Education. Circulars of Information Nos. 1, 2, 3, 4, 6, 7, 1888, No. 1, 1889. Report of the Commissioner of Education for the year 1886-87. *The Commissioner.*

Hydrographic Office. Notices to Mariners, Index Nos. 1—52 of 1888; Nos. 25, 27—34, 1889. Pilot Chart, North Atlantic Ocean, July and August, 1889. Chart No. 1128, Great Circle Sailing Chart of the South Pacific Ocean. Chart No. 1149, North America, West Coast of Lower California, San Diego to San Quentin Bay. Chart No. 1159, Central America, West Coast of Nicaragua, Brito Harbor. *The U.S. Hydrographer.*

MISCELLANEOUS.

(Names of Donors are in *Italics*.)

Biggs, A. B.—Observations of Comet of July and August, 1889, taken at Launceston, Tasmania. *The Author.*

Bourke, John G., Capt. Third Cavalry, U.S. Army.—Compilation of Notes and Memoranda bearing upon the use of Human Ordure and Human Urine in Rites of a Religious or Semi-Religious character among various Nations, (1888). Notes on the Cosmogony and Theogony of the Mojave Indians of the Rio Colorado, Arizona, (1889). *The Author.*

Clarke, Hyde—Gold in India (1881). Note on the Australian Reports from New South Wales, (1878). The Financial Resources available for the Development of our Colonies. The Iberian and Belgian Influence and Epochs in Britain (1883). The Picts and Preceltic Britain (1887). *The Author.*

Walters, Arthur Wm., F.L.S.—Bryozoa from New South Wales, (1889). *The Author.*

Photographs and Negatives of Billy Launy and Truganini, the last man and woman of the Tasmanian Race.
The Hon. J. W. Agnew, M.D.

Enlarged Photograph of the late Rev. J. E. Tenison-Woods F.G.S., F.L.S., taken and presented by *H. G. A. Wright, M.R.C.S.E.*

WEDNESDAY, DECEMBER 4, 1889.

Prof. LIVERSIDGE, M.A., F.R.S., President, in the Chair.

Twenty-one members were present.

The Certificate of one new candidate was read for the third time, of one for the second time, and of one for the first time.

The following gentleman was duly elected an ordinary member of the Society :—

Brett, Edward Edmund, J.P. ; East St. Leonards.

It was resolved that Messrs. P. N. Trebeck and H. O. Walker be appointed Auditors for the present year.

The Chairman announced that Journal Vol. xxiii., Part 1, was ready for distribution to Foreign Societies, and that bound copies of the volume would be forwarded to members when complete.

Mr. W. A. Dixon, F.G.S., F.I.C., read a paper on "Well and River Waters of New South Wales."

A discussion followed in which the following gentlemen took part, viz., Messrs. C. Moore, F. B. Kyngdon, H. C. Russell, J. B. Henson, P. R. Pedley, Rev. S. Wilkinson, J. F. Mann, the Chairman, and the Author.

Mr. Moore suggested that the Royal Society should bring under the notice of the Government, the great importance of having analyses made of the waters used for irrigation in the various parts of the Colony.

The thanks of the Society were accorded to Mr. Dixon for his valuable paper.

In the absence of the author, the Hon. Secretary (Mr. Kyngdon) read extracts from a paper by the Rev. John Matthews, M.A.,

Coburg, Victoria, on "The Australian Aborigines," which had been awarded the Society's Medal and money prize of £25.

A discussion followed in which Messrs. C. Moore, J. F. Mann, and the Rev. S. Wilkinson took part.

On the motion of the Chairman, the thanks of the Society were accorded to Mr. Kyngdon, for having read this and various other papers during the Session.

Mr. J. F. Mann exhibited various drawings relating to the Aborigines, which he had painted.

The following donations were laid upon the table and acknowledged :—

Donations Received during the Month of November, 1889.

(The Names of the Donors are in *Italics.*)

TRANSACTIONS, JOURNALS, REPORTS, &c.

Adelaide—Public Library, Museum, and Art Gallery of South Australia. Report of the Board of Governors and of the Standing Committees for 1888-9. *The Director.*

Berne—Département de l'Intérieur de la Confédération Suisse—Section des Travaux Publics. Graphische Darstellung der Lufttemperaturen und der Niederschlagshohen Bl. 1, 2, 3, 1888. Graphische Darstellung der Schweizerischen hydrometrischen Beobachtungen, Bl. ia, ib, iia, iib, iic, iii., iv., va, vb, vi., 1889. Tableau graphique des observations hydrométriques suisses, Pl. ia, ib, iia, iib, iic, iii. iv., va, vb, vi., 1888. Tableau graphique des températures de l'air et der hauteurs pluviales, Pl. 1, 2, 3, 1888. *The Department.*

Brussels—Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique. Annuaire, 1888, 1889. Bulletins, 3me Serie, Tome xiv.—xvii., 1887-89. *The Academy.*

Buenos Aires—Instituto Geografico Argentino. Boletin, Tomo x., Cuaderno vi. and vii., 1889. *The Institute.*

Cambridge—Public Free Library. Thirty-fifth Annual Report of the Library Syndicate, 29 May, 1889. *The Library.*

Hamburg—Deutsche Meteorologische Gesellschaft. *Meteorologische Zeitschrift*, October, 1889. *The Society.*

Hobart—Royal Society of Tasmania. Abstract of Proceedings. October 15, 1889. Presidents' Address by His Excellency Sir Robert G. C. Hamilton, K.C.B., 18 November, 1889. "

London—Anthropological Institute of Great Britain and Ireland. Journal, Vol. xix., No. 1, August, 1889. *The Institute.*

Iron and Steel Institute. Journal, No. 1, 1889. "

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LONDON—Royal Meteorological Society. Quarterly Journal, Vol. XV., No. 71, July 1889. The Meteorological Record. Vol. IX , No. 33, 1889. *The Society.*

Royal Society. Philosophical Transactions, Vol. CLXXIX., Parts A and B, 1888. Proceedings, Vol. XLV., Nos. 273-279, 1888-89. List of Fellows, 30 Nov., 1888. ,,

Zoological Society of London. Proceedings of the Scientific Meetings, Part ii., 1889. ,,

MELBOURNE—Field Naturalists' Club of Victoria. *The Victorian Naturalist*, Vol. VI., No. 7, Nov. 1889. Ninth Annual Report 1888-9. List of Members &c. *The Club.*

Public Library, Museum, and National Gallery of Victoria. Report of the Trustees for 1888. Natural History of Victoria—Prodromus of the Zoology of Victoria, Decade XIX., 1889. *The Premier of Victoria.*

Royal Sanitary Commission. Second Progress Report —Water Supply of the Metropolitan Area. Third Progress Report—Drainage and Sewerage. *The Commission.*

MEXICO—Observatorio Meteorológico Magnetico Central de Mexico. Boletin Mensual, Resumen del ano de 1888, and Indice Tomo I. Charts :—Inundacion de la Ciudad de Lagos ; Inundacion de la Ciudad de Leon ; Trayectoria del Ciclon de Septiembre de 1888 a traves de la Isla de Cuba. *The Observatory.*

Sociedad Cientifica "Antonio Alzate." Memorias, Tomo II., Cuaderno Núm 11, May, 1889. *The Society.*

NEW YORK—American Geographical Society. Bulletin, Vol. XXI., No. 3, Sept. 30, 1889. ,,

PARIS—Académie des Sciences de l'Institut de France. Comptes Rendus, Tome CIX., Nos. 13—16, 23 Sept. —14th Oct. 1889. *The Academy.*

Feuille des Jeunes Naturalistes, Année XIX., No. 228, 1 October, 1889. *The Editor.*

Société de Biologie. Comptes Rendus Hebdomadaires, 9e Série, Tome I., Nos. 31—33, 1889. *The Society.*

Société Entomologique de France. Bulletin, No. 17, 1889, pp. 169—176. ,,

Société Française de Physique. Collection de Mémoires relatifs a la Physique, Tome IV., 1889. (Mémoires sur le Pendule, précédés d'une Bibliographie.) ,,

PHILADELPHIA—Franklin Institute. Journal, Vol. CXXVIII., No. 766. October, 1889. *The Institute.*

ROME—Biblioteca e Archivio Tecnico. *Giornale del Genio Civile*, Anno, XXVII., Fasc. 7, July, 1889.

The Minister of Public Instruction, Rome.

Biblioteca Nazionale Centrale Vittorio Emanuele di Roma. Bollettino delle Opere Moderne Straniere acquistate dalle Biblioteche pubbliche Governative del Regno d'Italia, Vol. IV., No. 3, May-June, 1889. *The Library.*

Società Geografica Italiana. Bollettino, Serie 3, Vol. II., Fasc 9, 1889. *The Society.*

SYDNEY—Australasian Association for the Advancement of Science. Report of the First Meeting held at Sydney, N.S.W., Aug. and Sept., 1888, Vol. I. *The Association.*

Technological, Industrial, and Sanitary Museum. Report of the Committee of Management for 1888. *The Museum.*

ST. PETERSBURGH—Comité Géologique—Institut des Mines. Bulletins, Tome VII., Nos. 6—10, 1888; Tome VIII., Nos. 1—5, 1889; Supplement to Tome VIII., (Bibliothèque Géologique de la Russie 1888). Mémoires Vol. III., No. 4, 1889, (Allgemeine Geologische Karte von Russland); Vol. VIII., No. 1, 1888, (Ueber die Russischen Augellen, von J. Lahusen). *The Committee.*

WASHINGTON—Smithsonian Institution. Annual Report of the Board of Regents for the year ending June 30, 1886, Part i. *The Institution.*

United States Coast and Geodetic Survey. Bulletin, Nos. 10, 11, 12, 1889. *The Superintendent.*

United States Hydrographic Office. Notice to Mariners, Nos. 35 and 36, 1889. Pilot Chart of the North Atlantic Ocean, Sept., 1889. *The U.S. Hydrographer.*

YOKOHAMA—Seismological Society of Japan. Transactions, Vol. XIII., Part i., 1889. *The Society.*

MISCELLANEOUS.

(Names of Donors are in *Italics.*)

Dana, Prof. J. D., LL.D.—U.S. Exploring Expedition. Australian Fossils, Plates 6, 11, 13. *The Author.*

Wyndham, W. T.—The Aborigines of Australia. ,,

Frankfurt Zeitung, No. 192, July 11, 1889. *The Publisher.*

Wegweiser für Sammler, (Leipzig) No. 2, 20 Sept., 1889. ,,

PROCEEDINGS OF THE SECTIONS

(IN ABSTRACT.)

MEDICAL SECTION.

At the preliminary meeting held in April, the following officers were elected:—Chairman: Dr. CRAGO. Committee: Drs. P. S. JONES, W. H. GOODE, E. F. ROSS, W. CHISHOLM, A. SHEWEN, and S. T. KNAGGS.

Seven general meetings were held; they were well attended, but there was a lack of animation and interest in the discussions as compared with the previous year. Special mention should be made of the excellent and valuable papers read by Drs. NEWMARCH on "The Climate of New South Wales," Dr. HANKINS on "Wind Instruments," and Dr. CLUBBE on "The After-treatment of Tracheotomy."

Exhibits were made by Drs. SHEWEN, MACCORMICK, CHAMBERS, WORRALL, WATSON, JENKINS, and CRAGO.

Papers—

(1) "On Hydatid Fluid"—Dr. JAMES GRAHAM.
(2) "A new method of Ophthalmoscopy"—Dr. SCHWARZBACH.
(3) "On Aneurisms"—Dr. MACCORMICK.
(4) "The Climate of New South Wales, in its relation to Phthisis"—Dr. NEWMARCH.
(5) "Treatment of Throat Diseases"—Dr. QUAIFE, Junr.
(6) "The After-treatment of Tracheotomy"—Dr. CLUBBE.
(7) "On Cystitis"—Dr. WORRALL.
(8) "A case of Anæmia"—Dr. CRAGO.
(9) "On Wind-Instruments, and their relation to certain lung diseases"—Dr. HANKINS.
(10) "On a new Operation for the removal of Eutropion"—Dr. THOS. EVANS.
(11) "On a case of Transfusion"—Dr. WORRALL.
(12) "On two cases of Disease of the Lung"—Dr. SHEWEN.

EDWD. J. JENKINS, M.D.... } Secretaries.
ALEX. MACCORMICK, M.D. }

MICROSCOPICAL SECTION.

A preliminary meeting of the Section was held on 11th April, 1889, Mr. F. B. KYNGDON in the Chair.

The following officers were elected for the ensuing year:—Mr. S. MACDONNELL, Chairman; Mr. PERCY J. EDMUNDS, Secretary; Dr. H. G. A. WRIGHT, Messrs. T. BRINDLEY, A. P. BEDFORD, and T. WHITELEGGE, Committee.

Monthly Meeting held MAY 13th, 1889.

Mr. S. MACDONNELL in the Chair.

Mr. MACDONNELL exhibited Slides of Oribatidæ, sent from England by Mr. BOSTOCK, who is engaged in writing a monograph on them for the Ray Society.

Dr. WRIGHT presented to the Section a $\frac{1}{12}$" oil immersion lens (Powell & Leland) N.A. 1.5, lately from makers' hands, and pronounced by them one of the finest made by them of that class.

Monthly Meeting held JUNE 10th, 1889.

Mr. S. MACDONNELL in the Chair.

Mr. WHITELEGGE exhibited a new species of Zoophyte (genus Sarzia), also specimens of *Volvox globator*, *Polyzoa sagitta (Carbacea dissimilis)*, and an Ascidian *(appendicularia)*.

Monthly Meeting held JULY 9th, 1889.

Mr. S. MACDONNELL in the Chair.

Professor WALLACE (Edinburgh) was among the visitors present.

Mr. WHITELEGGE exhibited specimens of *Asplanchna myrmeleo*, *Hydatina senta*, *Bursaria truncatella* (a very large specimen, also a new species of Lascinularia, like *L. socialis*). A microscopic plant (*Pandorina morum*) was also shewn.

Monthly Meeting AUGUST 12th, 1889.

Mr. S. MACDONNELL in the Chair.

Mr. WHITELEGGE exhibited a new species of Rotifer (*Philodina roseola*), found in a small rock pool at Coogee.

Mr. WIESENER exhibited a number of microscope objectives and other apparatus, by Reichart of Vienna, including a halmometer and a camera lucida (after Zeiss).

Monthly Meeting, SEPTEMBER 9th, 1889.

Mr. S. MACDONNELL in the Chair.

Mr. WALKER exhibited specimens of Scale insects (*Aspidiotus coccineus*) from oranges.

Mr. WIESENER exhibited two new Microscopes, by Swift (London), one being a binocular dissecting microscope fitted with the Stephenson prism.

Mr. PERCY J. EDMUNDS resigned the Secretaryship, owing to his departure for England, and was accorded a vote of thanks for his services.

Monthly Meeting OCTOBER 14th, 1889.

Mr. S. MACDONNELL in the Chair.

Mr. MACDONNELL exhibited a Fresh-water Polyzoa—not identified—presumed to be *fredericella*.

ADDITIONS

TO THE

LIBRARY OF THE ROYAL SOCIETY OF NEW SOUTH WALES.

Periodicals Purchased in 1889.

American Journal of Science and Art, (Silliman).
American Monthly Microscopical Journal.
Analyst.
Annales des Chimie et Physique.
Annales des Mines.
Annals of Natural History.
Astronomische Nachrichten.
Athenæum.

British Medical Journal.

Chemical News.
Curtis' Botanical Magazine.

Dingler's Polytechnisches Journal.

Engineer.
Engineering.
English Mechanic.

Fresenius Zeitschrift für Analytische Chemie.

Geological Magazine.

Industries.

Journal and Transactions of the Photographic Society.
Journal de Médecine.
Journal of Anatomy and Physiology.
Journal of Botany.
Journal of the Chemical Society.
Journal of the Society of Arts.
Journal of the Institution of Electrical Engineers.

Knowledge.

Lancet.
London Medical Recorder.

Medical Record of New York.
Mining Journal.

Nature.
Notes and Queries.

Observatory.

Petermann's Geographischen Mittheilungen.
Philadelphia Medical Times.
Philosophical Magazine.
Proceedings of the Geologists' Association.

Quarterly Journal of Microscopical Science.

Sanitary Engineer.
Sanitary Record.

Science Gossip.
Scientific American.
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Books Purchased in 1889.

American System of Gynecology.
Analyst (The) Vols. I.—III.
Ashurst, J., The International Encyclopædia of Surgery.
Atlas of Illustrations of Pathology, Fasc VII., 1889. (*New Syd. Soc.*)
Australian Hand Book for 1889 and 1890.
Barbour, A. H. F., Spinal Deformity in Relation to Obstetrics.
Biedermann's Technish-Chemisches Jahrbuch, 1880, 1881, 1882, 1887, 1888.
Braithwaite, J., Retrospect of Medicine, Vols. XCIX., and C., 1889.
Braithwaite, R., The British Moss Flora, Parts ix.—xii.
British Association Report, 1888, (Bath).
Buckler, W., The Larvæ of the British Butterflies and Moths, Vol. III. (*Ray Society.*)
Buller's History of Birds of New Zealand, Parts xii. and xiii.
Challenger Report—Zoology, Vols. XXIX., XXX., XXXI., XXXII.
Charcot, J. M., Clinical Lectures on Diseases of the Nervous System, Vol. III. (*New Syd. Soc.*)
Clinical Society, Transactions, Vols. XXI. and Supplement, Vol. XXII., 1888-9.
Cohnheim Julius, Lectures on General Pathology, Vols. I., II. (*New Syd. Soc.*)
Cook, M. C., Rust, Smut, Mildew and Mould; an introduction to the study of Microscopic Fungi.
Davis, G. E., Practical Microscopy.
Duhring, L. A., Atlas of Skin Diseases.
Encyclopædia Britannica, Index Volume.
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INDEX.

A

Aboriginal Tribes of South Australia 331
Aborigines of Australia 36, 46
Actinozoa 187
Additions to the Library ... 524
Aids to Sanitation 450
Alcyonacea 187
Alcyonaria 187
Amorphous—Textures—New Zealand Rocks 109
Amphipoda 216, 219
Anæmia, a case of 522
Analyses of two Sugar plantation soils 32
Analysis of lime stone from Goulburn 329
—— of Prickly Pear 324
—— of Water from a bore at Cuttaburra, N.S.W. 327
—— Seven Hills 471
—— Coal seam near Lake Macquarie 472
—— Creek at Wagga Wagga... 471
—— Sands at Newcastle ... 467
—— spring at Blackheath ... 466
—— Cootamundra 470
—— Katoomba 466
—— Queanbeyan 472
—— Waverley 466
—— well at Cootamundra ... 470
—— Gunnedah... 469
—— Hunter River at West Maitland 468
—— Orange 471
—— Sydney near Belmore Park 467
—— Sydney near Parramatta-street 467
—— Tamworth 470
—— Wagga Wagga 471
—— West Maitland 468
Anatomy and Life History of Mollusca peculiar to Australia 15
Andesite Group, New Zealand Rocks 131
Aneurisms 522
Annelida 207, 307
Anniversary Address 1
Apoda 205
Arachnida 233
Araneida 233
Arthropoda 212, 317
Arthrostraca 216
Ascidiacea 294
Aspidiotus coccineus from oranges 523
Asplanchna myrmeleo 523
Asiphonida 242, 321
Astacidea 223
Asteroidea 200
Auditors 518
Augite Andesite... 134
—— Diorite 129
—— Dolerite 147
—— Gabbro 145
—— Porphyrite... 130
—— Rhyolite 118
—— Syenite 125
—— Trachyte 126
Australia, Indigenes of ... 340
Australian Aborigines ... 97, 335
—— Art, Sorceries and Superstition 413
—— Australian Languages 355, 422 496
—— Battle, law of 488
—— Burial Customs 407
—— Cave-drawings and paintings 414
—— Clothing, Dwellings, Food 391
—— Corroborees ...41, 413, 492
—— Customs 353
—— Dravidian Element ... 370
—— Diyeri Language... ... 434
—— Fire, mode of obtaining... 492
—— Government, Laws, and Institutions 397
—— Hunting, mode of ... 491
—— Implements... ... 349, 391
—— Kabi Language 437
—— Malay Element 377
—— Man-making, mutilations 407
—— Marriage 407, 490
—— Mythology and Tradition 345
—— Outlines of Grammar ... 431
—— Physical Characters ... 384
—— Shields (illustrations of)... 487
—— Vocabulary 498
—— Weapons 484
—— Words 426
Australian Race, Origin of ... 335
—— Rocks, microscopic structure 15
Backward State of Water Conservation, Causes of 91

B

PAGE.

Basalt Group, New Zealand Rocks 150
Basommatophora ... 278, 322
Bdelloida... 311
Biotite Diorite 128
—— Pyroxenite... 153
—— Rhyolite 116
Books purchased 525
Botanical Congress, Paris ... 46
Brachiopoda 293
Brachyura 225
Building and Investment Fund 13, 19
Burglar's Alarm 158
Burial Customs, Australian Aborigines 407
Bursaria truncatella 523

C

Carbacea dissimilis 522
Caridea 223
Causes of Backward State of Water Conservation... ... 91
Catametopa 228
Cave drawings and paintings of the Australian Aborigines ... 414
Cælenterata 178
Cephalopoda 281
Characteristics of Australian Aborigines, Mental and Moral 386
Chloritic Andesite 142
—— Basalt 152
—— Porphyrite... 130
—— Pyroxenite... 154
—— Rhyolite 120
Choano-Flagellata 301
Chondrospongiæ... 180
Cilio-Flagellata 177, 303
Cirripedia 215
Clarke Medal, Award of 14, 21
—— Memorial Lectures 98, 513
—— —— Fund 13, 19
Climate of N.S.W., Coast districts 506
—— Table-lands 507
—— the Plains 508
Clubbe, Dr. on the after-treatment of Tracheotomy ... 522
Clothing, Australian Aborigines 391
Committee-men of different Sections 20
Composition of Sugar Plantation Soils 32
Conservation of Water, Work in Victoria 87
Copepoda... ... ... 214, 320
Corroborees of Australia Aborigines 41, 413
Cornuspiculæ 306

PAGE.

Council, Officers and Members for 1889 20
Crago, Dr., on a case of Anæmia 522
Crinoidea... 197
Crustacea 212
Cryptozonia 202
Ctenophora 197
Ctenostomata 292
Cubomedusiæ 196
Cumberlandite 156
Customs, Australian Aborigines 353
Cyclometopa 226
Cystitis 522

D

Darling River, utilization of ... 84
—— Suitability for Weirs ... 85
Decapoda... 223
Desert Sandstone 17
Dibranchiata 281
Diorite Group, New Zealand Rocks 128
Diptera 233
Discomedusæ 196
Discussion on Irrigation ... 93
—— Australian Aborigines 331, 448
—— on Poudrette Factories &c. 461
Dixon, W. A., Sugar Plantation Soils 32, 46
—— Well and River Waters of New South Wales ... 465, 518
Diyeri Language, Australian Aborigines 434
Dolerite Group, New Zealand Rocks 146
Donations and Donors 22, 47, 54, 98, 159, 331, 515, 519
—— to Library in 1888 ... 15
Dravidian Element, Australian Aborigines 370
Drawings of Jupiter 157
Driving Clock for Star Photo-telescope 157
Dunite 154
Dwellings, Australian Aborigines 391

E

Echidna, Anatomy and Life History of 15
Echinodermata 187
Echinoidea 203
Edison's Phonograph 158
Edmunds, Percy J., on the application of Prismatic lenses for making normal-sight magnifying Spectacles ... 64, 97

PAGE.
Ellery, R. L. J., awarded Clarke Medal 14, 21
Elasipoda 206
Elvanite Group, New Zealand Rocks 114
Endcyclica 203
Enstatite Andesite 138
—— Diorite 128
—— Gabbro 146
—— Pyroxenite... 153
—— Rhyolite 119
—— Trachyte 127
Entomostraca 317
Entromostraca 212
Eruptive Rocks of New Zealand 97, 102, 156
Eutropion 522
Evans, Dr., on a new operation for the removal of Eutropion 522
Evidence from Physiology, Australian Aborigines 340
Examining Board for Engineers necessity of 90
Exhibits at Reception 158
Exocylica 204

F

Fauna, Invertebrate, Port Jackson 163
Felsite 122
Financial Statement for 1889... 18
Flagellata-Eustomata 301
—— -Pentostoma 301
Flooding Pasture Land, Simplicity of Process 82
Flying Machine Memoranda 70, 97
Fodder, Production of by Irrigation 83
—— plant, Prickly pear as a ... 324
Food, Australian Aborigines ... 391
Foraminifera 171, 300
Fresh-water Invertebrates ... 296

G

Galatheidea 232
Gasteropoda 246, 321
Geology of Australia 98
Gephyrea... 211
Gorgonacea 189
Goulburn Lime 328
Government, Australian Aborigines 397
Graham Dr. James, on Hydatid Fluid 522
Grammar, Outlines of, Australian Aborigines 431
Granitic Textures, New Zealand Rocks 107
Granite Group, N. Zealand Rocks 111
—— —— Biotite with Muscovite 111
—— —— Biotite without Muscovite 112
—— —— Hornblende 113
—— —— Muscovite 113
—— —— Schistose 114
Group (N. Z. Rocks) Andesite 131
—— —— Basalt 150
—— —— Diorite 128
—— —— Dolerite 146
—— —— Elvanite 114
—— —— Gabbro 145
—— —— Obsidian 120
—— —— Orthophyre 125
—— —— Pallasite 155
—— —— Peridotite 154
—— —— Picrite 154
—— —— Porphyritic... ... 129
—— —— Pyroxenite 153
—— —— Rhyolite 115
—— —— Siderolite 156
—— —— Tachylyte 152
—— —— Trachyte 125
Gymnolaemata 282
Gymnosomata 279

H

Hamlet, W. M., Burglar's Alarm 158
—— Analysis of Prickly Pear 324
—— On the occurrence of Arabin in Prickly Pear (*Opuntia Braziliensis*) 325
—— On the Evolution of the Kerosene Lamp 511
Hankins, Dr., on Wind Instruments and their relation to certain lung-diseases ... 522
Hargrave, Lawrence, Flying Machine Memoranda 70, 74, 97, 158
Health resorts in N.S. Wales, Meteorological Reports of ... 509
Heliozoa 299
Hemiptera 233
Heterotricha 177, 303
Hexaceratina 180
Hexopoda 233
High Tides of June 15–17 51, 53
Hirudinea 212
Holotricha 303
Holothurioidea 205

PAGE.

Homocæla 178
Honorary Members 21
Hornblende Andesite 131
—— Diorite 128
—— Dolerite 146
—— Gabbro 145
—— Granite 113
—— Porphyrite... 129
—— Rhyclite 117
—— Syenite 123
—— Trachyte 125
Hutton, Prof. F. W., on the Eruptive Rocks of New Zealand 97, 102
Hydatid Fluid 522
Hydatina senta 523
Hydromedusæ 191, 306
Hydrotachylyte 152
Hydrozoa 191
Hypotricha 305

I

Implements, Australian Aborigines 349, 391
Importance of the Pastoral Industry, Irrigation 75
Indigenes of Australia, Australian Aborigines 340
Infusoria 177, 301
Institutions of the Australian Aborigines 397
Invertebrate Fauna of Port Jackson and neighbourhood 173
Iodine in N.S.W. Mineral Water 327
Irrigable Areas, principal, in New South Wales 88
Irrigation 75, 159
—— benefitting Pastoralists ... 78
—— discussion on ... 93, 159
—— production of Fodder ... 83
—— rates for water 80
—— suitable methods of ... 78
Isopoda 220

J

Jupiter, Drawings of 157

K

Kabi Language, Australian Aborigines 437
Kerosene Lamp, Evolution of 511
—— construction and management of 512
Kymoscope 47, 54

PAGE.

L

Laemidipoda 219
Languages, Australian Aborigines 355, 422
—— —— The Diyeri 434
—— —— The Kabi 437
Larvacea 296
Lascinularia socialis 523
Laws, Australian Aborigines ... 397
Legislation for Irrigation, Want of 89
Lepralinæ 288
Library, additions by purchase 524
—— Donations in 1888... ... 15
—— —— and Donors' names 22, 47, 54, 98, 159, 331
Lime from Goulburn, analysis of 329, 514
—— Magnesia Series, New Zealand Rocks 145
—— Soda Series, New Zealand Rocks 127
Liversidge, Prof., Queensland Meteorites 158
—— Fungoid growths... ... 331
Losses, Irrigation, Statistics relating to 92
Lung, on two cases of disease of 522
Lypomata 294

M

MacCormick, Dr., on Aneurisms 522
Macroscopic Textures, New Zealand Rocks 107
Macroura... 223
Madreporaria 190
Malay Element, Australian Aborigines 377
Manfred, E. C., Notes on Goulburn Lime 328, 514
Map of Continental Australia... 158
Marriage, Man-making and Mutilations, Aust. Aborigines 407
Marine and Fresh-water Invertebrate Fauna of Port Jackson and neighbourhood 45, 54, 163
Matacostraca 216
Mathew, Rev. John, The Australian Aborigines 97, 335, 518
McKinney, H. G., Irrigation in its relation to the Pastoral Industry of New South Wales 75
Medal, Society's... 15, 45, 54, 97
—— Clarke 14, 21
Medical Section... ... 11, 521
Members, New ...20, 45, 53, 97, 330

PAGE.

Members and Officers of Council 1889 20
—— Honorary 21
—— Reception 97
Mental and Moral Characters, Australian Aborigines ... 386
Merey's apparatus, elastic traces 158
Meteorites, New... 46
—— from Queensland... ... 158
Meteorology of Australia, New Zealand and Tasmania ... 15
Meteorological Reports of Health Resorts in New South Wales 509
Microgranitic Textures, New Zealand Rocks 108
Microscopic Structure of Australian Rocks 15
Microscopical Section ... 12, 522
Minerals, Notes on 326
—— Porphyritic, New Zealand Rocks 107
—— -water, iodine in 327
Mingaye, C. H., Notes on some Minerals 326
'Mirrow-glance' 328
Mollusca, Fresh-water 320
—— peculiar to Australia, Anatomy of &c. 15
—— of Port Jackson 234
Molluscoidea 282
Monaxonia 181
Mucronellinæ 289
Muscovite Granite, New Zealand Rocks 113
—— Syenite 123
Mythology, Australian Aborigines 345

N

Nematoda 207, 307
Neuroptera 233
Newmarch, B. J., On N.S.W. as a health resort in Phthisis Pulmonalis ... 503, 521, 522
New South Wales, Principal Irrigable Areas 88
—— as a health resort in Phthisis Pulmonalis... ... 503
—— Well and River Waters, analyses of 465
New Zealand Eruptive Rocks 97, 102
Non-Felspathic Eruptive Rocks, New Zealand 153
Normal-sight Magnifying Spectacles 64, 97
Nudibranchiata... 276

O

PAGE.

Obsidian Group, New Zealand Eruptive Rocks 120
Officers and Members of Council 1889 20
Oligochaeta 307
Olivine Andesite 141
—— Basalt 150
—— Dolerite 147
—— Porphyrite... 130
Ophiuroidea 198
Ophthalmoscopy 522
Opuntia Braziliensis as a fodder plant 324
Origin of Australian Race ... 335
Orthoclase Rocks, New Zealand Eruptive Rocks 111
Orthophyre Group, New Zealand Eruptive Rocks ... 125
Ostracoda 213, 319
Oxyrhyncha 225
Oxystomata 230

P

Paguridea 231
Palla 120
Pallasite Group, New Zealand Rocks 107
Pandorina morum 523
Papers Read during 1888 ... 13
Paris, Botanical Congress ... 46
Pastoral Industry of N.S.W.,&c. Irrigation 75
Pectinibranchiata ... 246, 321
Pedata 205
Pelecypoda 234, 320
Pennatulacea 188
Peritricha 178, 304
Periodicals purchased 524
Peridotite Group, New Zealand Rocks 154
Phanerozonia 200
Phonograph, Edison's 158
Phosphoric Oxide, Sugar Plantation Soils 34
Photo-micrographs 159
Phthisis Pulmonalis, N.S.W. as a health resort 503
—— deaths from 505
Phylactolæmata... 323
Phyllopoda 212, 317
Physical Characters, Australian Aborigines 384
Physiology, Aust. Aborigines... 340
Picrite Group, N. Zealand Rocks 154
Pitchstone 121
Plagioclase Rocks, New Zealand 127

PAGE.
Platinum found in N.S.W. 326, 514
Platypus, Anatomy and Life History of 15
Ploïma 312
Polychaeta 207
Polyplacophora 272
Polyzoa, Fresh-water 322
—— Port Jackson 282
Polyzoa sagitta 522
Porcellanidea 231
Porifera, Sponges ... 178, 306
Porphyrite Minerals, New Zealand Rocks 107
Porphyritic Group, New Zealand Rocks 129
Potash-Soda Series 111
Poudrette Factories ... 450, 514
Present Risks of Pastoralists, Irrigation 75
Preservation of Water from Evaporation 45, 46
Prickly Pear, Analysis... 324, 331
—— Arabin in 325, 331
Prismatic Lenses for making Normal-sight Magnifying Spectacles 64, 97
Prizes and Medals awarded 15, 45, 97
Proceedings 18, 45, 53, 97, 159, 330, 511
—— of Sections... 521
Process of Flooding Pastoral Land, Simplicity of 82
Protoplasta 296
Protozoa 171, 296
Pteropoda 279
Pyroxenite Group, New Zealand Rocks 153

Q

Quaife, Dr. W. F., on treatment of Throat Diseases 522

R

Radiolaria 177
Rain Storm, Recent 42
Rainfall Map for 1889 (vide end of the volume)
Raninidea 231
Rates for Water for Irrigation 80
Reception to Members... 97, 157
Religious beliefs of Australian Aborigines 482
Rhizopoda 296
Rhizota 308
Risks of Pastoralists, Irrigation 75
River Darling, utilization of ... 84

PAGE
River Darling, suitability for Weirs 85
—— Waters in New South Wales analyses of 465, 518
Roberts, Sir Alfred, Anniversary Address 1
—— Collection of photo-micrographs 158
Rocks, Eruptive of New Zealand 97, 102
—— Lime-Magnesia, ditto ... 145
—— Lime-Soda ditto ... 127
—— Non-Felspathic ditto ... 153
—— Plagioclase ditto ... 127
—— Rhyolite Group ditto ... 115
Rock Groups, tabular view of... 110
—— Textures, Eruptive of New Zealand 107
Rotifera 212, 308
Russell, H. C., drawings of Jupiter 157
—— Driving Clock, Star Photo Telescope 157
—— on Meteorites 46
—— Note on recent rain storm 42
—— Rainfall Map for 1889 (at the end of the volume)
—— remarks on Flying-machines 97
—— Source of Underground Water in Western Districts 57, 97

S

Salt deposited from a spring at Queanbeyan, analysis of ... 472
Sanitary Section 11
Sanitation in Unsewered Districts, Aids to... ... 450, 514
Saussuritic Dolerite 149
—— Gabbro 146
Scaphopoda 279
Schistose Granite, New Zealand Rocks 114
Schizopoda 222
Schwarzbach, Dr., on a New Method of Ophthalmoscopy 522
Scutibranchiata... 267
Scyphomedusæ 196
Sections, Committee-men of ... 20
—— Proceedings of 521
Serpentine 155
Shewen, Dr., on two cases of disease of the lung 522
Shields used by Australian Aborigines 487
Siderolite Group, New Zealand Rocks 156

PAGE.

Siphonophora 196
Siphonida 234, 320
Soda-Potash Series 123
Sorceries, Australian Aborigines 413
South Australia, Aboriginal Tribes of 331
Sound Waves, testing speed of 158
Spectacles, normal-sight magnifying 64, 69, 97
Spelling of Native words ... 497
Spherulitic Felsite 122
—— Pitchstone... 121
Sponges (Port Jackson) ... 178
Sports and pastimes, Australian Aborigines 484
Statistics relating to losses, Irrigation 92
Stellerida... 198
Stephens, E., Personal recollections of the Aboriginal Tribes once inhabiting the Adelaide Plains of South Australia ... 331
Stomatopoda 222
Storm, Rain- 42
Stuart, Prof. Anderson, Kymoscope 47, 54, 157
—— Merey's apparatus ... 158
Suctoria 178
Sugar Plantation Soils, composition of &c. 32, 46
Superstitions, Australian Aborigines 413
Syenite Group 123

T

Tachylite Group 152
Tebbutt, John, on the High Tides of June 15 – 17, 1889... 51
Tectibranchiata... 274
Tentaculifera-suctoria 305
Testing Machine, automatic ... 158
Textures, New Zealand Eruptive Rocks 107
—— Amorphous ditto ... 109
—— Trachytic ditto ... 108
Thaliacea... 296
Thecosomata 280
Thompson, Dr. J. Ashburton, Aids to the Sanitation of unsewered districts (Poudrette Factories) 450
Thoracostraca 222
Throat Diseases, treatment of 522
Threlfall, Prof., Speed of Sound Waves 158
Tides, High 51

PAGE.

Tracheotomy, the after treatment of 522
Trachylyte Group, New Zealand Rocks 152
Trachyte Group, New Zealand Rocks 125
Traditions, Australian Aborigines 345
Transfusion, on a case of ... 522
Trematoda 307
Tunicata 294
Turbellaria 206, 306

U

Ucumble Tribe, New England 36
Underground Water in Western Districts, Source of ... 57, 97

V

Vermes 206, 306
Victoria, Progress of Water Conservation 87
Volvox globator 522

W

Want of Legislation, Irrigation 89
Warren, Prof., Testing Machine 158
Water Conservation, backward state and causes 91
—— Conservation in Victoria... 87
—— for Irrigation, rates on ... 80
—— Preservation 46
—— from bore at Cuttaburra, N.S.W., analysis of 327
—— Seven Hills 471
—— Coal seam near Lake Macquarie 472
—— Creek at Wagga Wagga... 471
—— Sands at Newcastle ... 467
—— spring at Blackheath ... 466
—— Cootamundra 470
—— Katoomba 466
—— Queanbeyan depositing salt 472
—— Waverley 466
—— well at Cootamundra ... 470
—— Gunnedah 469
—— Hunter River at West Maitland 468
—— Orange 471
—— Sydney near Belmore Park 467
—— Sydney near Parramatta-street 467
—— Tamworth 470
—— Wagga Wagga 471
—— West Maitland 468
Weapons of Aust. Aborigines... 484

PAGE.

Weherlite from Mt. Shamrock Gold Mine, Queensland ... 328
Weirs, on the Darling River ... 85
Well and River Waters of New South Wales, analyses of 465, 518
Western Districts, underground water, source of ... 57, 97
Whitelegge, Thomas, awarded Society's Medal and Prize 45, 54, 163
—— List of Marine and Freshwater Invertebrate Fauna of Port Jackson and the neighbourhood 163
Wind Instruments, and their relation to certain lung-diseases 522
Woods, Rev. J. E. Tenison-, awarded Society's Medal and Prize 15
—— death of 513
Worrall, Dr., on Cystitis ... 522
—— On a case of Transfusion 522
Wyndham, W. T., Aborigines of Australia 36, 46

Z

Zoantharia 190

FIGURE OF DAIBAITAH

SIR GEORGE GREY'S JOURNAL OF TWO EXPEDITIONS OF DISCOVERY IN NORTH-WEST AND WESTERN AUSTRALIA DURING THE YEARS 1837-39.

AUSTRALIA.

Ethnological Map based mainly on Philological Evidence.

Places where Tasmanian-Papuan influence specially recognizable

Places where Malay " " "

Papuan Streak

Malay Streak

So-called Dravidian and Tasmanian-Papuan influence understood to be almost universally distributed.

Longitude East 130 from Greenwich

RAIN STORM

MAY 25th TO 29th 1889.

150 151 152 153

32 33 34 35

Bellstrees
Gundy
Scone
Turanville
Brindley Park
Merriwa
Hunter R.
Muswellbrook
Dartmouth
Goulburn R.
Negoa
Denman
Bylong
Martindale
Jerry's Plains
Cullenbone
Mudgee
Burrandulla
Lue
Rylstone
Singleton
Wollombi
Gloucester
Goorangoola
Penshurst
Dungog
Stroud
HUNTER RIVER
Leconfield
Oakhampton Park
Morpeth
Maitland
Tomago
Tahlee
Port Stephens
Gooraba
Newcastle
Macdonald R.
Colo R.
Wyong
Gosford
HAWKESBURY R.
Cangoora
Bathurst
O'Connell
Bowan Park
Methven
Lithgow
Mount Victoria
Brewongle
Jenolan Caves
Oberon
Mount Wilson
Kurrajong
Pitt town
Richmond
Windsor
Arnold's Grove
Castle Hill
Field of Mars
Pennant Hills
Hunter's Hill
PARRAMATTA
Rooty Hill
The Valley
Rychora
Linden
Emu
Sydney
Prospect
Mulgoa
Sherwood
Canley Vale
Nepean R.
Bondi
Moore Park
Auburn
Burwood
Botany
Maryland
Glenfield
Cobbitty
Brownlow Hill
Camden
Campbelltown
Helensburgh
Picton
Sugarloaf
Appin
Nepean Tunnel
Wollondilly R.
Truro
Cordeaux River
Springfield
Wollongong
Mittagong
Bowral
Moss Vale
Shellharbour
Jamberoo
Kiama
Taralga
Crookwell
The Mount
Baw Baw
Goulburn
Bowning
SHOALHAVEN R.
Bengonia
Berry
Nowra

The diameters (not areas) of black spots are proportional to the amount of rain.

30"
20"
10"

SCALE

5d-26-90(C.)

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.

Diagram for the Rain Report for 1889.

RAINFALL MAP OF NEW SOUTH WALES. 1889.

1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889
Inches 33·46	29·38	27·66	20·48	25·05	30·75	19·93	20·73	20·11	17·96	15·86	19·48	26·04	34·99	13·40	29·25

SCALE.

70" 60" 50" 40" 30" 20" 10"

The diameters (not areas) of Red Spots are proportional to the amount of rain.
Incomplete returns are shown by a Red Circle round the Spot.
For quantities for each month and for the year see attached table.

Scale of Statute Miles.

0 10 20 30 40 50 60 70 80 MILES.

QUEENSLAND

NEW SOUTH WALES

VICTORIA

SOUTH AUSTRALIA

PACIFIC OCEAN

MURRAY RIVER

MURRUMBIDGEE RIVER

DARLING or BARWON RIVER

MACINTYRE R.

GWYDIR R.

NAMOI R.

CASTLEREAGH R.

MACQUARIE R.

BOGAN R.

LACHLAN R.

DARLING DOWNS

MOONIE R.

Brisbane

Tweed River Heads

Koorelah

Cumbalum

Clarence Heads

Grafton

Woolgoolga

Nambucca

Kempsey West

Port Macquarie

Camden Haven

Manning Heads

Port Stephens

Newcastle

Port Jackson

Broken Bay

Gosford

Wollongong

Kiama

Cape St George

Jervis Bay

Batemans Bay

Narooma Heads

Bodalla

Eden

Green Cape

Cape Howe

Sandy Hook Pt

White Revolving Light
Green Fixed Light

Harbor Lights Light Ship
Fort Denison Red Light.

Fixed Harbor Light.

Fixed Green Light.

Red Light Fixed

Fixed Light

Light to Harbor
Red & White

Harbor Light Fixed

Two Fixed Lights

Fixed Light

Red Light Fixed

Sydney

Newcastle

Maitland

Singleton

Muswellbrook

Scone

Tamworth

Armidale

Glen Innes

Inverell

Moree

Narrabri

Walgett

Bourke

Wilcannia

Menindee

Hay

Deniliquin

Albury

Corowa

Wagga

Junee

Cootamundra

Young

Yass

Goulburn

Berrima

Bathurst

Orange

Molong

Parkes

Forbes

Condobolin

Lake Cargelligo

Nyngan

Cobar

Bourke

Wilcannia

Broken Hill

Milparinka

Tibooburra

Yandama Downs

Packsaddle

Wonaminta

Louth

Tilpa

Warroo

Culgoa

Bullah Bullah

Tilta Tilta

Tarella

Mona Murtee

Momba

Lake Dick

Poolamacca

Corona

Purnamoota

Glenlyon

Outer Wall

Mt Gipps

Silverton

Broken Hill

Burta

Tandou L.

Nettlegoe L.

Tolarno

Coombah

Papilpah

Tareena

Avoca

Burtundy

Wamberra

Lake Victoria

Wentworth

Moorna

Pooncarie

Tarcoola

Conargie

Culluleraine

Arumpo

Terlee

D Block

Manfred

Clare

Till Till

Piste

Mulurulu

Pantlin

Weinteriga

Albemala

Boolba

Boolba

Teryawynia

Teryawynia L.

35 Mile tank

26 Mile Tank

48 Mile Tank

Culpa

Gunyulkie

Poopelloe L.

Tiltagara

Paddington

North Peak

Mt Manara Tank

Fulham

Fulham Park

Neckarboo

Nuntherungee

Packsaddle

Yeurtee

Purnanga

Yantabangee

Wilcara

Kallara

Nimbar

Eldorado

Dunlop

Tindarey

Merrero

Curraweena

Coronga Peak

Loolabah

Gilgoin

Warrawin

Buckingbong

Wombin

Willerton

Wambadee

Ridgery

Girilambone

Booroomugga

Sussex

Wilgar Downs

Mulga Downs

Barnato

Springfield N°2

Florida

Meryula N°1

Meryula N°2

Thorndale

Budgery

Lerida

Barrier Lake

The Meadows

Hermitage Plains

Panjuan

Nymagee

Babinda

Crowl Ck

Timandra

Woodlands

Tabratonga

Wyoming

Burra Burra

Melrose

Boona West

Brothers

Mowabba

Condobolin

Gunnedah

Coan Downs

Mt Hope

Dine Dine

Lachlan Downs

Boobera

Bedooba

Sandy Ck N°2

Moothumbil

Esmeralda

Tinda

Burra Burra

Mungery

Oaklands

Coradgery

Waroo

Waroo Downs

Tambua

Coronga Downs

Wuttagoona

Innesdown

Curranulpa

Tilsa

Buckambil

Marra

Lake Dick

Culgoa

Mt Murchison

Wilcannia

Wilcannia

Melrose

Culpa

Gunyulkie

Poopelloe L.

Bulla Bulla

Mulga Downs

Barnato

Springfield N°1

Amphitheatre

Florida

Cobar

Lerida

Barrier Lake

The Meadows

Hermitage Plains

Panjuan

Nymagee

Babinda

Crowl Ck

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Dine Dine

Lachlan Downs

Boobera

Bedooba

Sandy Ck N°2

Moothumbil

Esmeralda

Tinda

Burra Burra

Mungery

Oaklands

Coradgery

Caiwarro

Boorara

Currawynia

Hungerford

Talyealye

Willara

Tinapagee

Nocoleche

Numbardi

Dungarvan

Wangamone

Thurloo Downs

Elsinore

Ursino

Wanaaring N°2

Wanaaring N°1

Salisbury Downs 2

Salisbury Downs

Yancannia

Yantabangee

Wilcara

Kallara

Nimbar

Eldorado

Dunlop

Tindarey

Merrero

Curraweena

Coronga Peak

Loolabah

Gilgoin

Warrawin

Buckingbong

Wombin

Willerton

Wambadee

Ridgery

Girilambone

Booroomugga

Sussex

Wilgar Downs

Mulga Downs

Barnato

Springfield N°2

Florida

Meryula N°1

Meryula N°2

Thorndale

Budgery

Lerida

Barrier Lake

The Meadows

Hermitage Plains

Panjuan

Nymagee

Babinda

Crowl Ck

Timandra

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Tabratonga

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Bedooba

Sandy Ck N°2

Moothumbil

Esmeralda

Tinda

Burra Burra

Mungery

Oaklands

Coradgery

Woolerina

Mollen Plains N°2

Mollen Plains N°1

Toulby

Brenda

Gnomery

Dumble

Denman

Gerara

Talawa

Leaknappa Tank

Wellington Bridge Tank

Angledool

Barringun

Pirillie

Kurrajong Ck

The Lake Tank

Warraweena

Mapoga

Miltroy

Bunghill Tank

Wilkie

Fort Bourke

Bourke

West Bourke

Mt Oxley

Yanda

Toronga

Yabagungah

Actor Hill

Gomery Well

Toorale

Corrella Tank

Curraweena

Tillerman's Tank

Coronga Peak

Loolabah

Gilgoin

Warrawin

Buckingbong

Wombin

Willerton

Wambadee

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Coradgery

Kunopia

Bogabilla

Macintyre Brook

Dumaresq R.

Boreeyamma

Thallona

Yelarbon

Texas

Yetman

Mungindi

Gunnablum

Caldmurra

Yarawa

Goonal

Yagaba

Mogil Mogil

Collarindabri

Derra

Millie

Oreel

Dwenderrah

Bungalear

Goangra N°2

Drildool

Bookarrell

Egguri

Tarriaro

Goangra

Wee Waa

Pilliga Ck

Mt Foster

Gwabegar

Gwabegar Ck

Gwabegar Rd

Kenebri

Coonamble

Gulargambone

Quambone

Warren

Nevertire

Dubbo

Wellington

Mudgee

Gulgong

Merriwa

Denman

Singleton

Muswellbrook

Scone

Tamworth

Armidale

Glen Innes

Inverell

Moree

Narrabri

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Bourke

Wilcannia

Menindee

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Wagga

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Purnanga

Yantabangee

Wilcara

Kallara

Nimbar

Eldorado

Dunlop

Tindarey

Merrero

Curraweena

The Royal Society of New South Wales.

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Meetings held on the Third Friday in each month, at 8 15 p.m.

MICROSCOPICAL SECTION.

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Meetings held on the Second Monday in each month at 8 p.m.

GENERAL MONTHLY MEETINGS.

		May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
WEDNESDAY, (8 p.m.)	...	1	5	3	7	4	2	6	4

SECTION MEETINGS.

		May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
MEDICAL—Friday, (8·15 p.m.)	...	17	21	19	16	20	18	15	20
MICROSCOPICAL—Monday (8 p.m.)	...	13	10	8	12	9	14	11	9